

**A Summary Report
of the
2002 JUSTSAP Workshop**

**Outrigger Waimea Resort
Waimea, Maui, Hawaii**

November 11-15, 2002

DRAFT

**U.S. JUSTSAP Secretariat
Honolulu, Hawaii**

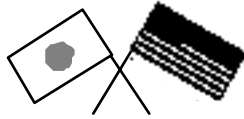
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- XCOR Aerospace

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BACKGROUND

Japan-U.S. Science, Technology & Space Applications Program (JUSTSAP)

The JAPAN-US Science, Technology, and Space Applications Program (JUSTSAP), originally known as the Japan-US Cooperation in Space Program, was formed in 1990 to promote and facilitate cooperative studies, research, and development in space systems and related applications. The initiative sprang from a collaborative effort among Dr. Burton I. Edelson, then at Johns Hopkins University, Professor Jun Nishimura, then Director-General, Institute of Space and Astronautical Sciences of Japan, and Mr. Takaji Kuroda, Corporate Chief Engineer of NEC Corporation. Admiral Thomas B. Hayward, then Chairman of the Hawaii Space Development Authority, agreed to host a workshop to bring together government, industry and academic people from both countries to focus on a cooperative program. The goal of the workshop was:

"To assess the role that cooperation might play, not only in benefiting the space programs of the United States and Japan, but also in enhancing scientific and technological efforts in the Pacific region and around the globe."

Pursuing this recommendation, the State of Hawaii (DBEDT), the Keidanren Space Activities Council, the Johns Hopkins Foreign Policy Institute, the Japan-U.S. Friendship Commission, and the University of Hawaii, staged a workshop on "Japan-U.S. Cooperation in Space" in Honolulu in November, 1990. The principal result of this meeting was the creation of a Japan-U.S. Cooperation in Space Program (JUSCSP) that focused on four major areas:

- (1) A Disaster Management and Observation: to help facilitate global environmental monitoring satellite system with the capability of providing disaster prediction, warning, and mitigation services to nations in the region.
- (2) A Satellite Communications System: to provide improved communications services for the Asia-Pacific region and to serve data transfer requirements that are not being met by existing international satellite or terrestrial communications networks.
- (3) Small Satellite Technologies and Launch Infrastructures: to develop versatile, low-cost satellites, launch vehicles, and supporting launch capabilities for a variety of scientific, communications, and remote sensing missions.
- (4) Space Technology and Applications Center (STAC): to promote applications of space science and technology that can support economic development opportunities in the Asia-Pacific region.

A JUSCSP Steering Committee was formed to guide the project, and four working groups were organized to pursue each of the above initiatives. Guidelines given to each working group included: (1) analyzing the need for and feasibility of specific projects; (2) surveying existing and planned capabilities to insure that proposed projects complement, rather than duplicate, work already in progress; and (3) involving, to the maximum extent possible, other countries in the Asia-Pacific region in project planning and development. The working groups were designed to coordinate these initiatives with appropriate government agencies - in particular, the National Aeronautics and Space Administration (NASA) and the Japanese space agencies (NASDA and ISAS). The Department of Business, Economic Development & Tourism (DBEDT), State of Hawaii, was appointed to serve as the U.S. Secretariat for JUSCSP.

At a meeting held in Kyoto, Japan in April 1992, the US-Japan Leadership Council (USJLC), a group of senior political and business leaders from both Nations, reviewed the reported activities of JUSCSP and gave its official endorsement to this initiative, with special emphasis on the development of the World Environmental and Disaster Observation Satellite System (WEDOS) concept. Following the USJLC endorsement, the JUSCSP held workshops annually in Hawaii as follows:

November 1992 - Hilo, Hawaii
November 1993 - Wailea, Maui
November 1994 - Lihue, Kauai
November 1995 - Wailea, Maui
November 1996 - Turtle Bay, Oahu
November 1997 - Kona, Hawaii
November 1998 - Kapolei, Oahu
November 1999 - Princeville, Kauai
November 2000 - Hilo, Hawaii
November 2001 - Waikoloa, Hawaii
November 2002 - Waimea, Maui

At the 1995 meeting, and in response to Hawaii's growing interest in broader science and technology issues, the plenary group changed the name of this initiative to the "Japan-U.S. Science, Technology, and Space Applications Program" (JUSTSAP). A new working group entitled "Science & Technology Coordination" was established to encourage bilateral cooperation in a variety of new areas such as oceanography, vulcanology, telemedicine, and/or other S&T areas appropriate for bilateral cooperation. This new body replaces the STAC Working Group. The State of Hawaii also became the official U.S. sponsor of JUSTSAP.

The 1996 JUSTSAP Workshop was held November 5-8 at Turtle Bay, Oahu, at which Hawaii's State Senator Matt Matsunaga was elected as the organization's new Chairman for a two-year term. A fifth working group on Microgravity Research was also established at the 1996 meeting, and planning began to facilitate a series of experiments aboard the U.S. Space Shuttle in the late 1990s. Discussions proceeded in the areas of disaster management and observation, with plans to research and support disaster observation and mitigation efforts throughout the Asia-Pacific region.

The JUSTSAP 1997 Workshop was held November 3-7, 1997 in Kona, Hawaii. At the Disaster Observation and Management Working Group meeting, a proposal to implement a Hawaii-based International Center

of Remote Sensing for Disaster Management (ICRSDM) was discussed. The Satcom Working group reviewed the results of the successful High Definition Video Experiment. This year was also the first that a meeting of the Microgravity Working Group was held. The name of the Space Technology and Applications Center (STAC) was officially changed to Science and Technology Coordination.

The JUSTSAP 1998 Workshop was held November 9-13, 1998 at Kapolei, Oahu. At the Satcom Working Group meeting existing experiments were reviewed, and a number of new broadband experiments were introduced. Also, the Communications Research Laboratory (CRL) in Japan made a presentation on its Gigabit Satellite project, which would be used to demonstrate high data rate SATCOM for interconnection of satellite and fiber networks. Of particular interest was the joint US-Japan Microgravity experiment, which was successfully flown on a NASA space shuttle. The Small Satellite and Launchers Working Group also inaugurated the University Space Systems Symposium, which since has been meeting annually to provide university students within opportunities to mentor with professionals in their field toward the design, development and implementation of space-based systems (for further information, visit the Worldwide Web at: <http://screem.engr.scu.edu/usss/usss00.html>). Finally, Hawaii's State Senator Matt Matsunaga was re-elected as the organization's Chairman for a second two-year term.

The JUSTSAP 1999 Workshop, held Nov. 8-12 at the Princeville Resort on Kauai, inaugurated a collaborative partnership between the Pacific Disaster Center (PDC) on Maui and the Asian Disaster Reduction Center (ADRC) in Kobe, Japan, to explore opportunities for sharing archived and real-time data files on natural and man-made disasters to enhance disaster monitoring, management, and mitigation capabilities within the Asia-Pacific region. Further microgravity experiments were planned for launch aboard the U.S. Space Shuttle, and a new round of trans-Pacific high data rate broadband satellite experiments were designed. The University Space Systems Symposium held its second annual meeting, hosting over sixty students from Japan and the United States. The next annual workshop was held at the Hawaii Naniloa Resort in Hilo from November 13-17, 2000.

The JUSTSAP 2001 Workshop was held at the Outrigger Waikoloa in Kona, Hawaii (JC to provide summary).



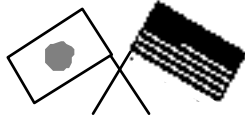
AGENDA

Japan-U.S. Science, Technology & Space Applications Program (JUSTSAP) Workshop

Outrigger Wailea Resort, Maui

<u>Date</u>	<u>Time</u>	<u>Event</u>
Nov. 11	15:30 – 20:30	Delegate Registration - <i>Kukui Terrace</i>
	16:00 - 17:30	Steering Committee Meeting I - <i>Awapuhi Room</i>
	18:30 - 20:30	Delegate Reception - <i>Pacific Terrace</i>
Nov. 12	7:30 - 8:30	Delegate Registration - <i>Kukui Terrace</i> Continental Breakfast - <i>Aulani Lanai</i> <u>OPENING CEREMONIES</u> - <i>Maile Room</i>
	8:30 - 8:40	<i>Words of Welcome</i>
	8:40 – 8:50	<i>Greetings from the Chairman</i>
	8:50 – 9:10	<i>Aloha from Hawaii</i>
	9:10 - 9:30	<i>The Perspective from Washington, D.C.</i>
	9:30 - 10:00	<i>Keynote Address</i>
	10:00 - 10:05	<i>Workshop Logistics</i>
	10:05 - 10:15	Group Photo Session – <i>Lobby Garden</i>
	10:15 - 10:30	Refreshment Break – <i>South Pacific Lanai</i>
	10:30 - 12:00	<u>Working Group Symposia/Special Sessions</u> •Microgravity & Materials Science •Space Power
	12:00 - 13:30	Luncheon – “Evolving Info Environment: Implications for Disaster Management Community” by Earnie Paylor/Peter Colvin”
	13:30 - 15:15	<u>Working Group Symposia/Special Sessions</u> •Microgravity & Materials Science •Space Power
	18:30 - 21:00	Reception & Dinner – <i>Kahoolawe Lawn</i>
Nov. 13	7:30 - 8:30	Continental Breakfast – <i>South Pacific Lanai</i>
	8:30 – 12:00	<u>Working Group Symposia/Special Sessions</u>
	12:00 - 13:30	Luncheon – <i>Haku Room</i>
	13:30 - 17:00	<u>Working Group Symposia/Special Sessions</u> • Microgravity & Materials Science • Space Power • Satellite Communications and Disaster Monitoring, Management & Mitigation Working Groups <i>Site Visit to Pacific Disaster Center & Maui High Performance Computing Center & Teleconference with the UN Disaster Management Conference In Bangkok</i>
	18:30 - 21:00	Reception & Dinner – <i>Lokelani Ballroom</i>

Nov. 14	7:00 – 8:00	Continental Breakfast – <i>South Pacific Lanai</i>
	8:00-12:00	<u>WORKING GROUP SESSIONS - Updates on Projects in Progress</u>
		•Satellite Communications
		•Disaster Monitoring, Management & Mitigation
		•Microgravity & Materials Science
		•Space Power
		•Small Satellites & Launches
	12:00 - 13:30	Luncheon – <i>Haku Room</i>
		Speakers: Joan Horvath, President – Takeoff Technologies
		Jeff Greason, President – XCOR Aerospace
		Topic: <i>Entrepreneurial partnerships for small payload launch opportunities</i>
	13:30 - 15:00	Free Time
	15:00	Bus Departs Outrigger for Closing Activity/Banquet
	16:00 - 20:00	Maui Ocean Center and Dinner
	21:00	Bus Returns to Outrigger
Nov. 15	7:30-9:00	Steering Committee Meeting II - <i>Plumeria Room</i>
	8:00 - 9:00	Continental Breakfast – <i>Aulani Lanai</i>
		<u>CLOSING PLENARY</u> – <i>Maile Room</i>
	9:00 - 10:15	<i>Symposia and Working Group Reports</i>
		•Disaster Monitoring, Management & Mitigation
		•Satellite Communications
		•Microgravity Research & Materials Science
		•Space Power Working Group
		•Small Satellites & Launchers/USSS
	10:15 - 10:30	<i>Steering Committee Report</i>
	10:30 - 10:45	<i>Concluding Remarks</i>
	Afternoon	<i>Optional Tour of Science City/Haleakala</i>



MINUTES - Steering Committee Meeting #1

**2002 JAPAN-UNITED STATES SCIENCE, TECHNOLOGY
& SPACE APPLICATIONS PROGRAM WORKSHOP**

**Outrigger Waimea Resort
Waimea, Maui
November 11, 2002
Awapuhi Room
4:00 p.m.**

Akiba-san opened meeting with Prayer for Edelson.

Jim gave overview.

Neil Helm reviewed Satcom experiments over the years. HDTV-post production experiment. Second ap ran from 1997-99, critiqued in 2000. Astronomy and human science telemed experiment also orchestrated. All successful. Application for next experiment in disaster mitigation. Teleconference with UN being held on Wednesday, involving ADRC and PDC as well as members attending Bangkok conference.

Steven Day: Looking to create “concrete” projects – difficult when members have “real full-time” jobs. Views role of WGs as catalytic, involving PDC and ADRC to actually focus on a specific scenario involving groups who can bring resources to the table (opportunity for triangulation).

Odawara-san: Symposium will focus on coming missions and planning for same. Already set up two missions with STS 107, but unfortunately postponed almost two years. Also, Japanese budget lacks continuity (year-to-year allocation). Wish to discuss a feasible way to identify and use money to support WG activities. If they just rely on government funding, difficult to plan for long-term. Trying to find alternative sources for support.

Basil: Concurr that STS 107 experiments will provide novel opportunities, and working on an additional experiment. But there is a serious thrust from NASA regarding microgravity – future seriously threatened. New NASA administrator is holding this line. There was a study commissioned by NASA (remap) that restructured priorities. Life science, and medical and biological sciences, have higher priorities. Possibly identify new focus that can synergize new priorities with what JUSTSAP does.

Martin: Ironical that future missions planned for Mars could derive much from basic research and technology development in microgravity. JUSTSAP can act as a contact point to identify Japan and U.S. thinking and provide white papers and commentaries on where the Space Station is going, and this would be a unique function that JUSTSAP could provide. Odawara – no chance for Japanese to

visit space station. Important to keep the dream alive for the students and future leaders. JUSTSAP can help promote this vision.

Martin: "Core complete" approach by NASA – limiting astronauts to three and stick to mission – NASA's approach to delimiting budget. But this is pushing back serious science and technology missions to 2007-08. Again, need to keep the vision alive during this period by promoting exchange of information. Feeling that new areas might be investigated (JC).

Nobu Kaya: Addressed Space Power agenda. NASDA and USEF are studying the potential for solar power satellites, and would like to discuss some of these opportunities. Have developed a scenario to conduct power beaming experiments between islands in Hawaii. Mark Henley from Boeing is also interested in this opportunity. Need more negotiation with Hawaii government to make this happen.

John Mankins: Wants to improve performance of demo – need a "countdown" to implement. Also would like to consider expanding focus of group to include advanced space infrastructures.

Yasaka-san: Reported on USSS workshop in Honolulu. 5th year. More than 60 participants – about equal between U.S. and Japan. Very simply presented and ideal for students. Miyazaki-san led the Japan team, and Chris Kitts the U.S. Dr. Kitts was unable to attend due to a medical emergency, but the symposium went well. Jim Grady also replaced Paul Coleman. Six groups met, each of which submitted white papers. Highlight of USSS was Cubesat. John Gregory from Space Grant was in attendance, and there is a possibility of arranging coordinated programs with both U.S. and Japan Space Grant programs. Also working group meetings were held concurrently. Nothing done on the "launch" side of the working group, but there is a possibility this could change in the future. Would therefore like to reform membership of working group. Jim Grady also mentioned that Stu Burley from PMRF spoke with the group about future launch opportunity.

Stephen Day: Commented on expectations for upcoming telecon with UN conference in Bangkok. Want to run a simulation involving a potential oil spill involving PDC, ADRC, and other interested groups. Would also like to involve other groups, such as the UN Outer Space Group, which is also focused on Disaster Monitoring and Mitigation. They wish to raise awareness about capabilities in disaster management with disaster managers worldwide. Would also like to focus on developing countries and set up workshops in these countries. Finally, they would like to promote regional workshops for potential users in the region. UN fully supports the JUSTSAP DM3 proposal. ADPC is also interested in the JUSTSAP demonstration, and will be participating in the Bangkok conference. The desirable outcome will be to get PDC, ADRC and UN to "buy in" to demonstration and provide the appropriate resources to make this happen. Neil Helm added that JUSTSAP is also open to other groups becoming involved. CRL rep seconded the CRL's interest in supporting this initiative. Mr. Hatori also mentioned the director from the ADRC is stolidly behind the demonstration. Neil Helm also mentioned the UN has already line up several nations who are interested in and willing to support the scenario.

Meheroo mentioned the Indian space agency also has strong interests in DM3 and that it might be well worth contacting same to get them involved.

GROUP discussion on future of JUSTSAP. Jim summarized key points.

Frank G. proposed we help increase public awareness about benefits of space research for the general public. Create a separate working group to promote space awareness. This would not only reinforce work we have done but also as a lobbying group for future support. There also needs to be a long-term view of the critical issues that face us – like future energy reserves. If we can find a foundation that wants to benefit mankind...we could provide info and lobbying material to effectively increase public awareness and long-term support. Frank S. also underscore importance of international cooperation in space. We could expand discussion to involve ESA and others.

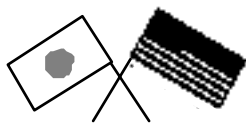
Ken: NASA spends a lot of money to justify their budgets, and spinoffs are a big part of this effort.

Yasaka-san: USSS participants feel JUSTSAP could address other critical issues that need to be discussed. For example, trade regulations which affect exchange of equipment and ideas in collaborative research. Another issue is radio frequency regulations. One solution would be to assign specific bandwidths for particular activities.

Frank S. proposed that one way of restructuring Steering Committee would be to establish representatives linked to specific goals or operations (like fund-raising). Stephen Day – focus on what makes us unique, and structure activities accordingly. Possibly involve ex-officio participants.

Will take discussion off-line.

Takaji asked co-chairs to be sure to coordinate reports and submit to Frank Gargione, who will coordinate.



MICROGRAVITY & MATERIALS SCIENCE WORKING GROUP REPORT

MINI-SYMPOSIUM PRESENTATION ABSTRACTS (Nov. 12-13, 2003)

“STS-107 Mission Information by Mr. Dan Bland (SPACEHAB, Inc.)

Due to orbiter maintenance requirements, technical issues with the shuttle fleet, and International Space Station priorities, the STS-107 mission has experienced 19 delays over the past two and a half years. Although frustrating to many customers, this critical research mission is sure to have numerous scientific discoveries. Currently scheduled for launch on January 16, 2003, this mission will debut SPACEHAB's Research Double Module(RDM), a pressurized, state-of-the-art research facility that flies in the Shuttle's cargo bay and has astronaut access via a versatile, segmented tunnel from the Shuttle middeck. Able to carry 9,000 pounds of experiments and equipment, the RDM will accommodate 30 experiments conducted by more than 80 investigators on this STS-107 mission.

Two of the experiments, sponsored by JUSTSAP, are the Japanese/US Protein Crystal Growth (JUSTPRO) experiment and the JUSTSAP STARS student experiment. Scientists and investigators will gather in Florida to prepare these experiments for flight in two of SPACEHAB's world-class facilities located in Titusville and Cape Canaveral. With the success of the STS-95 JUSTSAP-sponsored acceleration measurement experiment and the anticipated launch of two exciting research experiments on STS-107, the JUSTSAP forum is poised to take advantage of future space research opportunities.

“Observations of Melting in Microgravity from USMP-4 Experiment” by Dr. Martin Glicksman (Rensselaer Polytechnic Institute)

Dendritic growth is one of the most fundamental phenomena accompanying casting and solidification processes. Dendrites are the ubiquitous mode of crystal growth in freezing alloys, because they exhibit morphologies most suited to heat and mass transfer occurring at mesoscopic scales. Such length scales are typically the smallest scales of interest in ingots and castings. Chemical processes, such as microsegregation, thermal processes, such as latent heat release, and mechanical processes such phase-change volume changes, all commence to operate on length scales of the dendrite. Understanding dendritic growth is therefore considered essential for ultimately controlling macroscopic manifestations of these basic solidification processes.

A brief history of dendritic growth will be sketched, showing how the subject of dendritic solidification evolved from the earliest descriptive approaches of classical mineralogy and metallography, to its present status as a modern, thermodynamically based, applied science. Today,

for example, dendritic growth can be simulated approximately using advanced numerical methods—like phase-field computation. A truly comprehensive understanding and predictive capability of practical use to the foundry engineer, however, remains elusive. A view of dendritic growth will be presented that includes mesoscopic heat and mass transfer, capillarity effects at the solid-melt interface, interfacial dynamics, including morphological stability, side-branching dynamics, and phase coarsening. Experimental verification of dendritic scaling laws using microgravity experimentation will also be discussed, in an attempt to present a comprehensive view of this important subject.

Conduction-limited melting was also recorded as a convection-free processes in low-Earth orbit during USMP-4. We report on these melting processes, observed for the first time using video images, where both freezing and melting sequences for pivalic acid (PVA) were observed. PVA dendrites generally melt in a stable manner following a square-root-of-time dependence. The theoretical kinetics against which these experiments are compared is based on quasi-static kinetic analysis for melting under shape-preserving conditions. Comparison between theory and experiment yield Stefan numbers (dimensionless superheating) in good agreement with thermal data telemetered from the space-borne thermostat. The experiments and their analysis raise several new questions concerning the roles of capillarity, kinetics, and convection during melting processes.

“STS-107 JUSPRO Experiments” by Dr. Hideki Moriyama (University of Nebraska-Lincoln)

The JUSPRO experiment is now ready to launch. The selected proteins, a glucose isomerase and a tryptic enzyme, have large implication in the medical research. Glucose isomerase will give framework for sugar-protein interaction and the tryptic enzyme can also provide information related to destruction of signal transductions found in Huntington disease and Alzheimer disease. Besides such medial implications in the proposing the new therapy, physical implication is also important. Propose is to obtain the signature of protein crystal growth under microgravitorial environment provided by the space shuttle mission. The both proteins have been well studied in those crystallization conditions and recognized the proteins are very sensitive to change of environmental condition such as temperature and vibrations. We try to clarify of the nature of the crystallization in such unique environment to take advantage in the future utilization. The experiment is the comparative studies between the ground based crystal growth and microgravitorial one. The table of crystallization signature had been obtained after a series of protein crystal growth with varying many conditions. Once the experiments in the space have been done, pictorial comparisons will be done using the table to interpret the crystallization results. The analysis will be extended to diffraction level including diffraction capability, completeness, and twin characters. We expect the crystallization under microgravitorial environment could enhance the polarity of molecular spices during the transnational localization at crystal lattice with preventing twin or misalignment.

“STS-107 JUSTSAP STARS Program” by Mr. Dan Bland (SPACEHAB, Inc.) (on behalf of Mrs. Kimberly Campbell)

One exciting STS-107 payload is made possible through a unique commercial education program called STARS, operated by SPACEHAB. The STARS locker is comprised of six experiments designed by students from around the world. These future engineers and scientists from Australia, China, Israel, Japan, Liechtenstein, and the United States have developed biological and physical sciences experiments while working with astronauts and space experts. Results of the students' space and ground experiments, as well as design concepts and school information, are available online at www.starsacademy.com/sts107. The experiment from Japan, sponsored by JUSTSAP, is a student-designed aquatic habitat studying the microgravity effect on the hatching and behavior of Medaka fish eggs. The general objectives of this unique experiment are to observe the swimming behavior of the small fry upon hatching in zero gravity and to study the adaptation of the fry to a gravity environment once returned to Earth.

Maki Niihori, the principle investigator of the Medaka experiment, has received numerous benefits from her involvement in this hands-on, educational program. She has participated in a six-week internship program in Tucson, Arizona compliments of Paragon Space Development Corporation studying ecosystems and their delicate biological balance. Last Spring she participated in the SPACEHAB-sponsored Mission Simulation Test held at BioServe Space Technologies in Boulder, Colorado where she and students from the various STARS experiment countries practiced the loading, launch, and study of their experiments in preparation for the 16-day mission. Maki has also been the focus of much media attention where she has been featured in newspapers, on the Internet, and on Japanese and U.S. television.

“JUSTSAP II Experiment Status” by Dr. Mitsuru Ohnishi (National Aerospace Laboratory)

As the status of JUSTSAP II experiment, three contents are presented. At first, the background of the proposal for the experiment is introduced. The JUSTSAP I experiment in 1998 had two purposes. The first one is to measure the convective heat transport from quasi-steady accelerations. The experiment was successful on this purpose. However, good results could not be obtained on the second purpose, that is, the measurement of the effect of time-dependent accelerations. Thus, a follow-up experiment to detect such accelerations was considered. To understand g-jitter itself, its analysis was made. The analysis showed the g-jitter around 5Hz caused by the structural vibrations is the most important. Thus, the diffusion phenomenon whose eigen frequency must be high enough for their vibrations was selected as the candidate of JUSTSAP II.

Next, the result of the advanced g-jitter analysis and the development of its apparatus are introduced. The analysis emphasizes the importance of 5Hz vibrations. The apparatus was made as a self-powered and self-controlled one to make it applicable for any kind of flight opportunities. Passive dampers and automatic lock-unlock mechanism are used for the apparatus. To make the functional test of the apparatus, airplane experiment was successfully carried out. Validation of the isolation system was also made. From these results, the candidate was defined as JUSTSAP II

experiment at JUSTSAP 2001. At last, the future plan of JUSTSAP II is shown. Since this autumn, the research project to improve the apparatus especially on its weight has started. New concept to get both of damping and electrical connection at the same time is deeply considered to make base plates of the apparatus smaller. Dampers based on the concept and the plates will be made within 1 year. An airplane experiment will be carried out again. In the first quarter of 2004, this improved apparatus will be almost ready to fly. As the first step of the project, a trial product of the new damper has been made.

**“Unsolved Problems with Spacecraft Residual Accelerations” by Dr. Robert Naumann
(University of Alabama at Huntsville)**

The problem of residual accelerations on spacecraft has been of great concern to experimenters wanting to use orbiting vehicles to virtually eliminate convective transport in a variety of experiments involving fluids. Many theoretical studies have been conducted to predict the effects of such accelerations and the JUSTSAP experiment on STS-95 verified the theoretical predictions for transient and quasi-steady accelerations. However, no definitive experiments have been conducted to measure the effects of periodic accelerations, known as g-jitter.

Since these vibrations arise for the most part from internal forces, the net acceleration must time-average to zero. Steady state periodic accelerations applied to a fluid in a completely filled container with an imposed density gradient will drive first-order flows that time-average to zero. Likewise, the resulting first-order thermal and solutal fluctuations time-average to zero. Over the range of frequencies in the vibrational environment expected on the ISS, the velocity oscillations tend to be nearly 90° out of phase with the thermal and/or solutal fluctuations; consequently, little net transport occurs from the first order effects. We must therefore examine possible higher order effects that can lead to significant net transport.

Second order flows with non-zero time averages arise from the non-linear terms in the flow equations and from incomplete cancellation of first order flows if the periodic acceleration has both axial and transverse components relative to the imposed density gradient. One major issue is, will be second order flows from the vibrations spectrum on the ISS be large enough to be measured in the presence of the effects of the quasi-steady acceleration? To address this issue, the types of second order flows will be discussed along with their predicted effects. It will also be shown that the earlier JUSTSAP experiment can not only set upper limits on some of the theoretical predictions, but also gives some indication of the presence of a type of second-order flow that seems to be in conflict with the time-average flow calculations of Gershuni and Monti.

“Exposure Material Tests on ISS” by Dr. Eiji Miyazaki (Tokyo Institute of Technology)

The present mission that is being performed on International Space Station (ISS) named Service Module / Space Environment Exposure Device (SM/SEED) is introduced. On the mission, five tests with three kinds of ceramic materials are conducted, which are AlN, SiC with two different

sintering methods, and ion-plated TiN on two kinds of substrates. The test has begun since October 15, 2001 with three sets of hardwares consisting of the same sample configuration. Each set will be exposed for different durations: one year, two years, and three years. The first set exposed for 315 days has just returned to the earth on November 10, 2002. The next Japan's mission "JEM/SEED" is also introduced. It will be launched in 2007 as installed at Exposed Facility of JEM (KIBO) before the launch.

Additionally, the problems around materials exposure missions are discussed. Though it is necessary to perform a lot of exposure tests for future space missions, the opportunities would not be enough. Thus, a model to solve the problems is suggested in order to increase the mission opportunities. Passive missions such as materials exposure tests can be suitable for such model with a concept "Niche mission". The model suggested here has some requirements such as no-EVA, piggy-bag transportation, repetitive use, etc. And JEM (KIBO) Air Lock is selected as a key hardware for the model. Though it is just a model so far, thinking of the future missions is quite important. I hope that the niche mission will become "constant mission" in the future resulting in a new road to the future space missions, i.e., development of new concept spacecrafts and activities on planets/satellites.

"Investigations of Materials Exposed in Space" by Dr. John Gregory (University of Alabama in Huntsville)

UAH provided materials experiments which flew on the Long Duration Exposure Facility (LDEF), and on several Shuttle flights to study the interaction effects of fast atomic oxygen on a variety of materials surfaces. A summary of this experience will be given as well as some review of the mechanisms of the interaction. Recently, we have been experimenting with beams of fast O and N atoms impinging on semiconductor surfaces at the Los Alamos National Laboratory, Fast Neutral Beam Facility. Some new developments here will be described.

"Oxides from Space: Oxide Thin Film Optical Microdetectors for Retinal Implantation" by Dr. Alex Ignatiev (University of Houston)

The studies on the Wake Shield Facility of Atomic Oxygen interaction with evaporated metals to form epitaxial stoichiometric oxide thin films in spaced at nominally room temperature has driven new laboratory-based work on epitaxially-grown complex oxides. The lab-based work has identified a class of novel oxides that are not only chemically stable (as many oxides), but also optically active. These oxide thin films have been applied to chemically-stable optical microdetectors that can be implanted into the eye to replace damaged optical sensors in the eye. Optical response is in the visible range of the spectrum, and output of an individual microdetector can be as high as 2 Volts. The thin film oxide is patterned into an array of up to 500,000 microdetectors that are then transferred to a bio-degradable carrier layer and implanted into the eye in place of damaged rods and cones. The microdetectors are expected to excite (polarize) the neighboring bipolar cells by a large applied electric field (and not charge injection), and this polarization is expected to give a sensation of seeing. The microdetectors have been shown to be biocompatible, and will be tested for functionality through human trials to begin in 2003.

“Combustion Synthesis in Space (JUSTOM)” by Dr. Frank Schowengerdt (Colorado School of Mines)

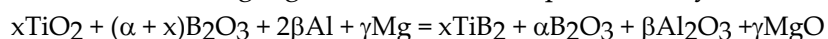
This paper reports on a proposal titled “Combustion Synthesis of Functional Materials,” which was recently submitted by the authors to NASA Code UG in response to the 2002 combustion NRA. Although the proposal was not successful, the effort was the start of a collaboration that will continue under the auspices of JUSTSAP with the design of experiments to be done on the International Space Station. Support for these experiments will be sought through various divisions of NASA and other agencies of both the U.S. and Japanese governments.

The objectives of the research are to advance the science of combustion synthesis into new materials not traditionally produced by the process. These materials include the important technological materials such as rugged high-temperature glass-ceramics for infrared applications, thermoelectrics and SiC-based semiconductors for operation in extreme environments. The studies include the effects of gravity and electric fields on the structure and properties of the materials produced in the combustion synthesis process.

Self-propagating High Temperature Synthesis (SHS), or Combustion Synthesis, is a novel technique used to produce many advanced materials. SHS has the following advantages compared to the traditional melting-casting route: 1) it is energy saving, since no high temperature melting is required and the processing time is short; 2) there is a relatively high purity in the final product, since high combustion temperatures reached in SHS reactions can result in evaporation of low boiling point impurity elements; and 3) it is a simple process that saves time and does not require elaborate facilities. Owing to these advantages, it is likely that materials produced by SHS will have a lower cost compared to conventional melting-casting techniques. The challenge is controlling the process to reliably produce materials of predictable microstructures, porosities and mechanical and optical properties from given starting mixtures and under known experimental parameters. The key to meeting these challenges is research carried out in a variety of experimental environments, including microgravity.

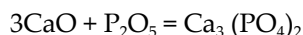
This paper discusses primarily the glass-ceramic work. The work on thermoelectrics and semiconductors will be covered in the following talks by Professors Munir and Odawara, respectively.

Composites with B₂O₃- Al₂O₃- MgO glass matrices were produced by the following reaction:



where both aluminium (Al) and magnesium (Mg) reduce the TiO₂ and B₂O₃ at the combustion front, forming Al₂O₃ and MgO and releasing heat in the process. The compositions of the final products and amount of heat released in the reaction depend on the coefficients, a, b, and g. SEM and XRD results on this system showed large areas of glass matrix interspersed with TiB₂ particles.

Effects of gravity on SHS reactions are dramatic, and result in larger and more uniform pores in porous ceramics, and more uniform dispersion of ceramic particles in glass-ceramics. Bioglass in the form of tri-calcium phosphate has also been synthesized by SHS in this laboratory, starting from the reaction:



This material shows considerable promise for the production of near-net-shape bone implants made from impressions taken in damaged bone. Hydroxyapatite, a major component of natural bone, has been observed deposited on this material after exposure to simulated body fluids.

It is also possible to produce functionally graded materials via SHS, as has been shown by several of us. These materials can be graded in both composition and porosity to meet requirements for special applications; for example, as thermal barriers and heat radiators.

The effects of gravity on the synthesis of functional materials will be studied in Space-DRUMSä, a containerless processing facility scheduled to be installed on the International Space Station in March 2003. This facility, which was developed by CCACS member Guigne International, Ltd., of St. John's Newfoundland, utilizes 20 acoustic projectors in a dodecahedron configuration to hold a 10-cm sample motionless in the center of a combustion chamber. All of the functional materials described in this and the subsequent talks can be studied in Space-DRUMSä. The group will work over the next year to develop additional proposals and designs for such experiments on ISS.

“Microgravitational Combustion Synthesis Activities” by Dr. Osamu Odawara (Tokyo Institute of Technology)

Combustion synthesis research carried out in Tokyo Institute of Technology under microgravity conditions has been introduced and focused to its advantage for performing the ceramic-metal composite particles such as TiB₂-Al composites. Combustion synthesis technology is also useful as chemical ovens applied in short-time microgravity conditions. III-V and II-VI compounds such as GaP, InP, Ga_xIn_{1-x}P and InCuS₂ from the powder mixture reaction show the fine particles of products more uniformly distributed compared to those obtained in the terrestrial condition. The microgravitational combustion synthesis activities of Russian group have been also introduced, specially the experiments done in the MIR space station in 1997.

“Electromagnetically Accelerated Plasma Spraying Process” by Dr. Shu Usuba (AIST, METI)

A method to accelerate fine powders in the velocity range of 1 km/s to 3km/s is developed and applied to the spray coatings. Powders about 10 micro meter size are accelerated and heated by electro-magnetically accelerated plasma produced by an arc discharge of pulsed current of 100kA in peak in a coaxial plasma channel. Recent results of this EMAPS (Electro-Magnetically Accelerated Plasma Spraying) process including a formation of dense crystalline B₄C deposit with Vickers hardness of 2600, a B₄C-rich deposit by B - C chemical reaction and a solid lubricant deposition from nano-cluster diamond are presented. Under gravity, it is difficult to prepare the floating

particles in the working gas, which is initial condition of EMAPS process, with independently controlled number density of particles and pressure of working gas. Therefore microgravity environment is considered to be useful to develop and verify the models of EMAPS.

“Particle Dynamics in Clinostats: Simulating Microgravity on Earth” by Dr. Carlos F. M. Coimbra (University of Hawaii-Manoa)

The dynamics of a non-neutrally buoyant particle moving in a rotating cylinder filled with a Newtonian fluid is examined analytically. The particle is set in motion from the center of the cylinder due to the acceleration caused by the presence of a gravitational field. The problem is formulated in Cartesian coordinates and a relevant fractional Lagrangian equation is proposed. This equation is solved exactly by recognizing that the eigenfunctions of the problem are Mittag-Leffler functions. Virtual mass, gravity, pressure, and steady and history drag effects at low particle Reynolds numbers are considered and the balance of forces acting on the particle is studied for realistic cases. The presence of lift forces, both steady and unsteady, is taken into account. Results are compared to the exact solution of the Maxey-Riley equation for the same conditions. Substantial differences are found by including lift in the formulation when departing from the infinitesimal particle Reynolds number limit.

For particles lighter than the fluid, an asymptotically stable equilibrium position is found to be at a distance from the origin characterized by:

$$X \approx -V_\tau / \Omega \text{ and } Y/X \approx (C_s / 3\pi\sqrt{2}) \text{Re}_s^{1/2}$$

where V_τ is the terminal velocity of the particle, Ω is the positive angular velocity of the cylinder, Re_s is the shear Reynolds number $a^2\Omega/\nu$, and C_s is a constant lift coefficient.

To the knowledge of the authors this work is the first to solve the particle Lagrangian equation of motion in its complete form, with or without lift, for a non-uniform flow using an exact method.

“Nano Materials in Space” by Dr. Masamichi Ishikawa (Mitsubishi Research Institute)

Scientific domains under microgravity have grown according to the progress of space station program. Since future missions in space experiments are extending to biotechnology, medicine and nanotechnology due to the great challenge of human exploration to Mars, we need to reorganize the scientific disciplines of microgravity programs. In this report, we characterized the evolution of basic sciences under microgravity as: 1) fluid science which investigates transport phenomena and physics of materials processing, 2) fundamental physics which investigates physical laws regulating the complex nature of our world in the microscopic scales, and 3) nano chemistry which realizes nano shapes and patterns with unique functions from molecular levels. These sciences would contribute to the evolution of “Nano Processing in Space” leading to the development of nanotechnology by self-assembling, that is, bottom-up nanotechnology in other naming, and its application is very promising to future industrial technological revolutions.

“Field Effects in Synthesis: Terrestrial Observations and Microgravity Expectations” by Dr. Zuhair Munir (University of California at Davis)

The objective of the work is to determine the effects of electric fields on the dynamics of self-propagating combustion synthesis (SHS) waves in the absence of gravitationally-induced buoyancy and phase separation effects and to determine the intrinsic role of the field in phase formation and structure evolution during synthesis. The rationale for the work is based on two general observations: (1) gravity has been shown to play a significant role in SHS reactions and (2) the imposition of an electric field has been shown to have a marked influence on the dynamics of SHS waves and on the mechanism of the synthesis reactions. In this context the field is therefore regarded as another processing parameter.

MICROGRAVITY WORKING GROUP WORKSHOP (Nov. 14)

The microgravity working group discussed the following items:

- I. Issues facing JUSTSAP
- II. Microgravity Working Group title
- III. 2003 Microgravity symposium
- IV. Japan US Microgravity Collaborative Projects

I. Issues facing JUSTSAP

The Microgravity working Group (MGWG) discussed all of the issues facing JUSTSAP that were raised during the steering committee meeting on Monday. The following items were specifically discussed:

- With regards to the real purpose of JUSTSAP the MGWG concluded that the collaborative projects and the symposia by our working group has indeed provided the greatest impact onto JUSTSAP. Thus it is felt that JUSTSAP has every reason for benefiting from our working group.
- It was strongly felt that the MGWG fits extremely well with the JUSTSAP mandate.
- MGWG will work to increase its membership, within reason, since it was felt that having too large a membership could dilute the impact of our working group onto JUSTSAP. We will certainly work to increase industry participation in our working group.
- JUSTSAP funding issues were also discussed and some suggestions were made that could help in the funding issues. One item is to try to reduce the cost of the Workshop by eliminating most of the meals during the workshop and also try to hold the workshop on university campus, etc.
- The Working group believes it is performing in the best mode possible, vis., several microgravity joint flight experiments have already been performed and many more to be performed in the near future.

II. Microgravity Working Group Title

After heated and long deliberation it was decided that the working group title should remain the “Microgravity and Materials Working Group”. It was strongly believed that our title fits very well with what we have done in the past and what we hope to accomplish in the future.

III. 2003 Microgravity Symposium

Our working group is planning a 2-day mini-symposium which will include the following general items:

- Progress reports on 2 microgravity experiments to be performed on STS 107.
- JUSPRO, a protein crystal growth experiment and JUSTARS, a Japan student experiment.
- Progress report on a yet to be flown microgravity experiment JUSTSAP II.
- Progress report on SPACEDRUMS, an industry combustion synthesis facility to be placed on ISS.
- Progress report on Space Exposure Experiment.
- ISS PI briefings, one from US and another from Japan.
- Briefing on a free flyer Japan experiment USERS.
- Presentations by Life science PI's, one from US and another from Japan.
- Briefing by Parabolic flights providers one from Japan and another from US.

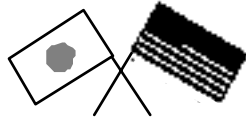
IV. Japan US Microgravity Collaborative Projects

The working group discussed future collaborative efforts including the following specific projects:

- Combustion Synthesis
- Solar Cells
- Education: try to work within the US space grant consortia to implement collaborative student experiments on microgravity.

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DISASTER MANAGEMENT, MITIGATION AND MONITORING (DM3) AND SATELLITE COMMUNICATIONS (SATCOM) WORKING GROUP REPORT

DM3/SatCom Joint Symposium - Summary

by Stephen Day, Co-chair, DM3.

1. Scope

- 8 presentations on space applications of Disaster Management, Mitigation & Monitoring (DM3)
- Tour of Maui Super Computer facility
- Video conference with UN Disaster Management conference in Bangkok, Thailand

2. Accomplishments

- Highly effective and interactive joint symposium of US and Japanese delegates.
- Conceptualized and proposed disaster simulation project - tanker oil spill caused by an event such as a tsunami, in a loading port off Okinawa, causing significant collateral damage (fire).
- Pacific Disaster Center (PDC) and Asian Disaster Reduction Center (ADRC) agreed to lead simulation pilot project. Purpose will be to produce tangible outputs that can be left behind and further developed (e.g., training aids, future simulation projects).
- Highly successful video conference from PDC to UN Outer Space group in Bangkok, resulting in informal agreement to cooperate on simulation project. This will include possible Affiliate status of JUSTSAP with the UN, and specific linkage with DM3/Satcom group of JUSTSAP for simulation project.
- JUSTSAP DM3/SatCom advisory group will be formed to work with, and provide appropriate guidance on, the Simulation Project.
- Other organizations from the US and Japan are invited to participate including CRL, NASDA, Okinawa prefecture and civil defense organizations, ADPC, Asian Development Bank, etc., from Japan, and NASA, USAID, Coast Guard, US Navy, etc., from the US.

3. Accountability/Contact points for next steps

- PDC Peter Colvin (Exec. Director), and Dr. Earnie Paylor (Administrator)
- ADRC T. Hatori (Senior Researcher) and S. Nishikawa (Director).
- David Stevens, UN Outer Space Group
- JUSTSAP Advisory Group (Dr. J. Pelton, Mr. F. Stetina, Mr. P. Wood, Mr. Neil Helm, Dr. Suzuki, Dr. T. Iida, J. Meheroo and others who wish to participate).

DM3/SatCom Joint Symposium – Detailed Notes

(Rapporteur Notes by Barbara Wood, pwwood@inteliport.com)

Morning, 12 November 2002

Stephen Day, US CoChair of DM3, opened the session with Introductory Remarks in behalf of this year's collaboration between the Satellite Communications Working Group and the Disaster Monitoring, Management & Mitigation Working Group.

Day presented a recommendation of relevant documentation: Web sites for these publications will be published in the symposium proceedings. He cited two useful new publications on disaster management:

- "World Disaster Report" published by Red Cross/Red Crescent
- "Disaster Response GIS for Public Safety" by Gary Amdahl, ESRI Press, \$19.95 (www.esri.com/gisstore)

Statistical update of DM3 was presented to the delegates:

- During the 1990's \$620 billion in damages and 800,000 people killed in natural disasters, not counting manmade disasters
- 2 billion people worldwide were affected by disasters
- initial response is at the local level; disaster preparedness is beneficial

UN directive to reduce hunger and poverty must focus on risk management; "Human assets have increased and therefore the impact on humanity increases"; "Costs of prevention paid in the present, benefits lie in the future..."

Disaster risk reduction is JUSTSAP's focus. Day introduced the proposed joint DM3/SATCOM project based on a disaster scenario at a Japanese site (upon which Neil Helm will expand later this morning), to involve other interested parties. It will be the subject of a video conference with the UN Office of Outer Space Affairs Disaster Management Workshop in progress in Bangkok. The video conference is to take place during the JUSTSAP Workshop visit to Pacific Disaster Center nearby.

Tomohiko Hatori, Asian Disaster Reduction Center:

The planned video conferencing with United Nations Meeting on Disaster Management in Bangkok Thailand will be a benefit to JUSTSAP's mission.

Joseph Pelton: with Neil Helm, had visited ADRC Kobe, where they saw documentation of ADRC activities. How to get access other than through a website? Hatori: Perhaps by end of year 2002 it will be accessible to outside users.

Neil Helm, US Co-Chair, SatCom Working Group,: SATCOM W.G. has had 2 successful experiments:

- Post-production cinema Trans-Pacific transmission experiments have been flown
- Astronomy for Students program involves Japan & US students in classrooms involved in operating, maneuvering & viewing through telescopes on satellites. Systems operate at 50 MB.

- Human science programs involving US & Japan students in medical schools or medical curricula, examining anatomy, medical taxonomy, etc.

DM3 has taken on increased significance as a JUSTSAP Working Group due to the annual increase in natural and manmade disasters.

Yoshiaki Suzuki, Sat Division, Communications Research Laboratory, Japan:

- *NASDA, ADRC, & CRL are conducting tests using existing satellite systems; now developing airborne systems
- *Test flights at Okinawa will demonstrate satellite monitoring experiment for DM3 project. Terrestrial communications are easily destroyed in a disaster.

Toru Ohmori: Prediction and trends relating to risk management become more important for Disaster Management personnel.

Helm if more money is invested in disaster prediction and risk management it would save much money in recovery.

Pelton: Recognition has recently been given to Norway interests for establishing plans for a luxury ship (floating platform called Gaiaship) for use as an international forum and meeting place to discuss subjects of world interest. Topics could include disaster management, among others. Gaiaship's mission would move forward involving the Arthur C. Clarke Future Center (see The Futurist magazine, November-December 2002 issue).

Day: Bangkok meeting wants to support a simulation project to predict DM3 consistent with UN initiative. Mandated project should include various groups (JUSTSAP being the catalyst) ADRC, PDC, etc.

Helm: Disaster Simulation development on paper. How do we build our tools, systems, collaboration and response to an imaginary disaster? "International Disaster Exercise Scenario" will examine all aspects of DM3.

Peter Colvin, Director, Pacific Disaster Center: Important to consider not just what happens (the execution of the scenario) during the imaginary event, but what happens during the planning for disaster prevention, mitigation, and recovery.

Peter Wood: Don't limit the scenario to just space applications; distribution & other earth-bound systems should be built into triage system.

Day: David Stephen of the UN Workshop has expressed interest in private projects, simulations, good preparation, and testing use of high technology to learn what works, or doesn't work. Our intent is to have PDC and ADRC lead the execution of the scenario, with JUSTSAP as a catalyst and enabler.

Helm: Presentation of the Simulation Scenario

Incident: supertanker aground with jet fuel in the water (later revised to a supertanker moored to an Okinawa US fuel depot, which capsizes in a tsunami, at a site on the southwest coast, about 50 miles north of Naha.)

What environmental effects must we consider? Not just the obvious immediate damage, but like ripples in a pond...oil spill effects on pristine beach of Okinawa (tourism economy affected); tsunami capsizes ship; potential for explosion.

Supertanker can carry a million barrels (40-50 million gallons); has explosive power of nuclear weapon (10 square miles). A certain potential of enormous loss of life in sprawling Port of Naha city.

Responsible Disaster Management response parties: shipping company, Prefecture of Okinawa, Japanese Government, US Department of Defense, nearby US oil storage & docking facility, etc.

Synergy of satellite technology (communications, positioning, remote sensing), computing, information models, networks of satellite Internet, high altitude aircraft platform with TV and sensors, all fused into scenario, displays of event in real-time.

(Many nations will want to participate in the Internet access of information relating to Disaster Management after United Nations expresses its interest after the current meetings).

Exercise Goals: training exercise for JUSTSAP, demonstrate advanced tech, synergy of technologies with Disaster Management models & tools, international team, technical documents and training aids.

Real-time assessments will be developed to cover all possibilities for subsequent and related disasters.

Legacy documents vital for future beneficial use.

Colvin: Similar scenario (Sakhalin, Kamchatka) project has been done by PDC in cooperation with Russia (EMERCOM), utilizing inadequate Russian telecommunications. The Scenario had to use chat rooms (more stable than video or telephone) on the Internet to maintain communications. As we approach the development of the JUSTSAP DM3 Scenario, we should not criticize other nations' systems or models, but work with them to the best of our ability. Don't place too much emphasis on technology. Advanced preparation, risk assessment, on-site training are more important efforts on which to focus. IT capabilities should be examined, and institutional sharing important. Clear policies on data access are needed. Organizational capability depends on ongoing training. S. Day & F. Gargione: On 9/11, when land lines did not work, cell phones got through, Internet got through, international calls got through.

Wood: Advanced planning should include pre-positioned salvage assets and clean-up agencies; a global inventory of these assets should be worked into the Scenario. Lessons can be learned from the

Exxon Valdez grounding in Alaska. US Navy is the leading salvage organizations on the US government side, while E. Paylor, PDC: (comment) Marine Spill Response Corps was developed following Exxon/Valdez and may have information useful to the Scenario. Wood: Education and public awareness is critical in successful disaster response. Ohmori: sell the product to potential funding institutions by pointing out the better the preparation, the less funds needed for recovery. Wood: Example of 2 similar disasters of comparable magnitude of the Scenario are the Halifax Nova Scotia WWI explosion & San Francisco (Port Chicago) California USA explosion WWII; both would be good arguments for the study. General Eisenhower once said that advance planning is key; although we will never fight a war the way we plan it, we will fight it better because we have exercised through planning.

Perhaps (budgetary reasons) the Scenario may be slipped until next year. Ohmori: Okinawa government may contribute to funding the Scenario.

Pelton: the cost of the Scenario depends on funding by outside organizations. The exercise could reach into the \$5 million range. Budgeting should be the first step. Paylor, PDC: Based on past experience with similar Scenario development the cost could be about \$250,000.

Fran Stetina: FIJI study looked at weather patterns and trends in the course of a 3-year project. Achieving integrated technologies, communications & networking of organizations resulted in global community participation. Each participating organization or nation contributed assets, concluding in the continuation of modeling and forecasting by each individual nation.

Wood: DLR's mission to enable the European Union's Detailed Description of Intentions on the subject of "Satellites in the Service of Humanitarian Relief and Disaster Mitigation-a workshop for decision-makers and field practitioners." DLR or the European Union may agree to a collaboration with JUSTSAP. Would they contribute to a Japan/US project? Is the name JUSTSAP a barrier to global participation?

www.dfd.dlr.de/dfd/workshop/bruessel/detailed_intention.html

Stetina: JUSTSAP should define the project, then handed it over to operational agencies which will secure funding & make it happen.

LUNCHEON PRESENTATION: "Evolving Info Environment: Implications for Disaster Management Community" by Earnie Paylor/Peter Colvin

- To maximize the development of DM3 tools, develop them once, then use them simultaneously and often.
- Situational Awareness vs Situational Knowledge requires a knowledge-based workforce.
- A Network-Centric Environment is dynamic & interoperable, as opposed to a network centric vs platform/ system centric
- DM3 should be proactive, not reactive, and anticipate problems, manage risk, prepare, and build resilience to hazards.
- Create partnerships, and utilize information & communications infrastructure.
- The System of the Future envisions an advanced network sensor constellation providing real time information synthesis for situational awareness, and be accessible by desktop & palmtop computers, which will result in knowledge rather than data for Disaster Management managers.
- Geospatial information integration and analysis identifies hazard zones, demographics, infrastructure, facilities, supplemental data, and enabling the modeling of useful Scenarios for disaster prediction.
- The GID Environment provides integration for projects by coordinating systems, and connecting networks. GIS on the Internet is evolving into a global capability composed of many collaborating organizations using global geographic information.
- The Global Information Grid globally interconnects information capabilities about associated processes and personnel, which enables collecting, processing, storing, disseminating, and managing information. Global applications include a computing power, processing, and communications foundation for network operations and information management.
- Network-Centric Evolution reaches beyond the pre-WEB stovepipe systems to CURRENT network connections to FUTURE "distributed information network".
- The Information cycle is as follows: TPED->tasking->processing->exploitation->dissemination, as contrasted with to TPPU tasking->posting->processing->using parallel processes instead of linear.
- Improved observation systems and data are the realization of the opportunities for Disaster Management and Humanitarian Assistance, for example, integrated decision support systems. Stakeholder groups include those offering humanitarian assistance, Disaster Management, Homeland Security, land use planning, transportation, agriculture, and more.
- The capacity of the community to deal with a disaster and before there is a disaster is essential. Natural upheavals do not represent a disaster unless humans are involved and impacted. Fundamental understanding that the tools used should mitigate the effects of earth events on humans is required. While earth events are episodic, DM3 should not be.
- Networks' purpose would be served if it alleviates effects of earth events on communities with a non-supportive economy to DM3 development programs
- Emergency Management Directions are toward understanding of people property & hazards, risk & vulnerability interaction, adaptation, then sustainable development. Enabling Technologies include data collection, database development, modeling & analysis, information networking, which equals visualization.
- Understand feasibility vs operational capability. Technology needs to be scalable to be of use to the user.

Afternoon, 12 November 2002

"Roles of Asian Disaster Reduction Center" by Tomohiko Hatori

In January 1995 the Hanshin Awaji earthquake struck Japan. The response was confused and ineffective. As a result in 1998, Kobe ADRC was founded. ADRC has achieved Observer Status with the United Nations.

The JICA Disaster Management Training & ADRC visiting researcher program were founded in response to the India disaster (earthquake?) that killed 20,000 people.

"Now & Future of Disaster Management" is an experiment/simulation utilizing only Japan's cities as examples. Later simulations will include other ADRC countries.

Scenario encompasses 3-days after disaster before government assistance reaches victims. The most essential factor is enabling the use of personal computers in the aftermath of a disaster. Tools must be developed to enable macroscopic (airplane & satellite) early damage assessment as well as microscopic (car, handy-cam) damage assessment later. Tools identified as necessary to the Scenario: EOS satellites of various functions (remote sensing, global positioning, etc.), airplane camera, helicopter camera, fixed camera, car camera (IP-VSAT via radio), handy camera to assess stricken area on site. GPS data was transmitted direct to personal computers via CRL/ADRC headquarters. All Disaster Management Organizations (whether in stricken or non-stricken areas) can access geographical data over PCs.

ADRC has submitted its budget to NASDA for the next fiscal year to include the Scenario. The Plan for Components of the System will be ready by January 2003. In response to potential users' requests, the Scenario will include a real time damage assessment and information dissemination system. Data provided to the users will be largely in the form of movies & still photographs.

The ADRC organization is focused on Disaster Management planning, systems development and training, but cannot offer the hardware. Individual countries take the simulations and implement them into their own local DM3 operations. (See ADRC brochure.)

ADRC budget is currently \$2 million, with fifteen employees. Member nations provide their own local staffs.

"PDC Partnership Initiatives" by Peter Colvin, PDC.

Collaboration with ADRC for experimental project is set for this November. The purpose will be to demonstrate mature or maturing technologies that could be applied to deal with disasters, pre-event, as well as post-event. The project will explore the collaborative aspects of technology to communicate information to partners in the Asia-Pacific Region. The project will organizationally and technically push the limits to determine maximum DM3 capability.

Historical and current data have been compiled into a model of a Natural Hazards map of the Circum-Pacific Region including the Ring of Fire, and includes weather hazard patterns. Historical damage and frequency is represented by disaster type. Episodic, long-term, natural and human-

induced disasters are included. Priority forecasting takes into account immediate threat to life, and property vs longer-term devastation of society and economic environment. The most destructive disasters are the ones that take the longest to occur.

The Hazard Management Model requires structural change to society, including change of perceptions, stress management, vulnerability, and public awareness. Stetina: NASA wants to help... Colvin: PDC is working on a structural plan that will be reasonable and workable for collaboration with other organizations. Stetina: Partners learn from each other. ADRC didn't mention tsunami-warning sirens; Hawaii uses them very successfully. A damaging tsunami occurs every 2 years.

Most important is connection and response to local emergency management organizations. Simplification of Internet data and information sources is essential. Interactive risk assessments using ESRI technology provided historical risk assessment information by Region.

For example, Port Villa (South Pacific Island, Vanuatu) Tsunami Simulation simulates a tsunami event resulting from an earthquake. It evaluates the ability of DM3 managers to simulate and assess tsunami impacts, and estimates damage costs computed by building type. Stetina: Information available at NASA that could assist other countries to project damage assessment. NASA developed this information and made it available to anyone who wants it.

Colvin: Mitigation Planning Model for American Samoa is underway including Risk Assessment.

PDC Web Portal will be available soon. Demonstration to be given to JUSTSAP on visit to PDC later this week.

US-Russian Disaster Simulation Exercise: both groups collaborated via on-line chat rooms; NOAA and US Coast Guard participated. EMERCOM Oil Spill Models were contributed by the Russians.

S. Day: Where is the value added to current operations by conducting the exercise? Colvin: 40% of the exercise is organizational; 40% is technology; 20% execution. The most important results of the exercise were collaboration and a new relationship. The most important contribution for JUSTSAP to leave-behind would be a continuing collaboration. USCG and the Russian counterpart provided the structural modeling; if same type of organizations could collaborate between JUSTSAP and the target nations, the Scenario experiment would be a success.

J. Pelton: NSA went to Africa and left behind the idea and framework for Africa to pick up. Nothing developed, however. Stetina: The study philosophy of East-West Center could be utilized. Can they do this experiment? Colvin: Perhaps the UN connection may help. As far as E-W Center planning, that may not work. Conducting the experiment or study in a policy venue would be more up their line; however, the E-W Center Director has no knowledge of JUSTSAP. Oil companies could be approached to enter into a participation, which may lead to development of an interest in hazards of oil production and transportation.

"Okinawa Subtropical Environment Remote-Sensing Center" Hirumitsu Wakana & S. Fujii, Communications Research Laboratory

CRL looks at high temperature seawater (warm current "Kuroshio") with respect to Asian monsoons and typhoons, ocean atmosphere & global climate changes. Wind velocity during typhoon is measured. Research & Development of remote sensing technology has resulted in the 400 MHz band wind profiler radar; long range ocean radar; bi-static polarimetric radar (COBRA) TRMM. Bistatic polarimetric radar measures rainfall intensity.

P. Wood: The model shows at the 200-meter depth curve the current velocity taking a sharp turn to the right. Wakana: This is due to GIS not being able to accurately measure current velocity over deeper water. However, the model can measure wave height and length, and can measure oil spill thickness and direction traveling for purpose of JUSTSAP Scenario. Typhoon direction, location and intensity are measured by TRMM. Pelton: Is this modeling capable of future prediction? WAKANA: It can be done, but is not in this historical model presentation.

Day: Should we be studying the typhoon instead of the tsunami? Today oncoming typhoons and hurricanes give adequate warning for evacuation; the Scenario should be about something completely unforeseen and immediately damaged. Colvin: Our goal is not to characterize a tsunami, rather characterize the oil spill. Pelton: We must map out what we are going to measure, how to do it, what results we are hoping to achieve. Helm: Devise a list of assessments that we want to make. Pelton: In preparation for tomorrow we must have appropriate questions ready for video-conference with Bangkok.

OPEN DISCUSSION: Oil Spill Scenario caused by tsunami

Colvin: Develop a Scenario framework, but avoid over-structuring. Consider what information products would a decision-maker want. Wood: Determine assets available, and time restraints. Pelton: Don't overwhelm local disaster authorities with things beyond their control. Helm: Responsibility for spill recovery must be determined early. Request a dialogue feedback from the end users about what their response would be after a one-year local study. Ohmori: Japan action item to visit Okinawa local disaster emergency organizations & report back next year. Helm: 2003 JUSTSAP will be a real planning & development of this scenario. Keep it simple; avoid the danger of detailing out the scenario. Wood: Design a multi-phase program of developing the scenario, with Phase I including 4-5 of the parties, following with more in-depth planning at next year's meeting. Helm: His presentation has been sent to Bangkok; during tomorrow's video-conference, he will verbally extend Scenario implementation from October 2003 to JUSTSAP meeting in 2004.

Morning, November 13, 2002

"Experiment of "Telecom/Broadcasting Mission Using a High Altitude Solar Powered Aerial Vehicle Pathfinder-Plus" by H. Wakana, CRL, Communications Research Lab

"HAPS (High Altitude Platform systems) Project Status" by Yoshiaki Suzuki/H.Wakana

3 flights have been accomplished, of which 2 were successful, and 1 partially successful (Barking Sands, Kauai). Each flight was completed within 24-hours from take off to landing.

In addition to GSO and NGSO satellites, HAPS is smaller (20 km) and will be used for terrestrial wireless applications (cellular phones). Satellite characteristics: small delay, small loss and high resolution.

Candidate vehicles include solar-powered large air ships 150-250 meters, solar power UAVs, and aircraft (high altitude jet).

Pathfinder Plus by NASA is a powered flying wing reaching 98 km/hr. It has been tested for digital TV, and IMT-2000 terrestrial band (2 GHz), while user terminal is an off-the-shelf cell phone.

On the second flight, Oahu caused interference with ground station on Kauai, so antenna array was modified from 2 elements to 9 elements to correct the interference.

Summary: The first telecom demonstration D-TV and IMT-2000 using HAPS was a success, thanks to collaboration between US & Japan. General usage will begin in 2008.

Pathfinder-Plus circles the earth at the altitude of 20 km, and can be used for disaster monitoring before, during and after. Angel Technologies tested at 45,000 feet video and communications over Los Angeles (data available). Japan plans number of HAPS=5; diameter of service area 450 km, minimum elevation angle 5 degrees. Alternative: number of HAPS =16, diameter of service area 220 km, minimum elevation angle 10 degrees. AQ volcano video from Hokkaido is one demonstration of the system.

An issue of licensing and band distribution must be considered. The failure of mobile satellite telephone usage for general public could be revived with a disaster management mission.

"Airborne Video/Satellite Monitoring of Disasters" "NASA I-Space Project" by Yoshiaki Suzuki/Dr.Toru Ohue, Satellite Mission Research Center, NASDA

3-satellites were used: ETS-VIII (launch 2004), WINDS (launch 2005), QZS (Quasi-zenith satellite/figure 8 orbit)

Experimentation includes applications such as disaster management, medical/welfare, education/research, news gathering, broadband Internet and multicast, digital divide, global positioning.

In January 2003, an experiment will be conducted by jet plane over the Kobe Japan area (Memorial Day of Hanshin great earthquake). On-site diagnosis assessment of damage will be conducted by a person outfitted with a GPS and headset camera on motorcycle or on foot. A DM3 experiment was conducted in Malaysia using these methods.

The I-Space Project integrates 3 satellite projects. Satellite Mission Research Center plans, surveys, and conducts application experiments. External & International partners work in cooperation with NASDA's programs.

Helm: I-Space may be used in JUSTSAP's Scenario. Pelton: A formal proposal must be submitted, and the deadline will be next April 2003.

H. Wakana: The system performance to produce still photographs from a helicopter is being improved. Nadir aspect images from helicopter will provide a 3-Dimensional overlay onto an existing grid map.

"Earth Alert Project" by Fred Schamann, NASA Earth Alert Project manager (Fran Stetina of NASA gave presentation in Fred's behalf)

NEMA (National Emergency Management Agency) is comprised of state organizations. There has been no National warning system in the past; states depend on TV weather/warnings. The recently formed new official National warning system (5 months old) Earth Alert, was originally conceived following the request of Roy Price to warn Hawaii of oncoming tsunami. The development of the effort began 10 years ago.

Earth Alert makes use of many different existing communication systems: wireless, existing bandwidth, telephones, copper wiring, etc., and transmits to a box installed in private houses. Hand-held units (Palm, etc.) have been developed to communicate with the existing cell phone systems, and base stations have been established. Two-way communications are built into the electronics. The purpose is to send warnings to hand-held units in the form of graphic maps, weather warnings, etc. For use by local emergency managers, digital Damage Assessment formats replace paper forms. Visual display of roads and buildings is to be assessed.

A test base station is operational in Maryland USA. The whole system is currently under a 1-year test. A small company is developing service for NASA and using it as a showcase for future sales as a subscriber service. Currently government funding is supporting the effort, and 5 government personnel are working on the project. The NASA Center at Stennis is involved in research for NASA's Disaster Management effort. Developers include MITRE, Lucent Technologies, and NASA. ESRI mapping information software is used. The intent is to replace paper reports with digital information. A test will be run in Maryland for one year. NASA Stennis Center has a DM center.

Such systems have been installed in southern Asian countries, Russia, and Pacific Rim nations over the past 2 decades.

"EpiInfo Handheld-Operational Data Collection on Mobile Computers" by Thomas Hasling, Center of Excellence for Disaster Management and Humanitarian Assistance-Tripler Army Medical Center, Information Systems Support, Inc.

Last year's presented paper described a portal for DM3 utilizing databases from military and civil sources. The program was tested in Thailand last year. Application for Centers for Disease Control Nutrition Department was discussed regarding local training, multi-lingual application.

EpiInfo 2002 was a free product for users who needed analytical DM3 tools. Epidemiologists need to collect and analyze data. EpiInfo produces formats for recording individual case data, for example, food poisoning symptoms.

The analytical software functions on a laptop. Palmtops can be the original entry computer that connects with base station central computer. Language selection by palmtop can be transmitted to base computer & retranslated. Palmtop computer language has been rewritten to enable ease of use.

Primary barrier to system success is resistance at the user level, rather than language, bandwidth, or other technology. Training users on Palmtop form usage is faster than training on paper forms.

Beginning December 2002, Centers for Disease Control will begin program of tracking smallpox vaccination history throughout the US.

EpiInfo System is complete and ready to implement. It should prove useful for epidemiologists.

"Define Scope/Responsibilities of Disaster Simulation Project" by all delegates

Helm: asked for input from all delegates of anything not discussed yesterday

- consider the Scenario a 2-day exercise

Day: Scenario not limited to one single type of disaster

Gargione: ripple effect requiring a greater variety of responses;

Colvin: compressed time frame (3-hours = 3 days) when doing exercise with Russians, understanding development of disaster from different points of time

Wood: de-limit the scope of impact of disaster to reduce complexity of Scenario

Helm: "experiment-creep" is a hazard leading to endlessly complex Scenario

Gargione: "creep" ok for formation period of a few months, but later it should be contained

Helm: proposed that Scenario planning be completed at 2003 JUSTSAP 2-day meeting, then Scenario itself be kicked off for the following 12 months. All players must be contacted and involved through next 12 months to be present at 2003 JUSTSAP.

Colvin: What do we tell to UN during video conferencing?

Helm: Technology demonstration & information sharing.

Day: What is the expected successful end result?

Pelton: desired outcome be the formation of a Steering Committee to connect global DM3 organizations, who will engage in Memoranda Of Understanding to participate.

Ohmori: be flexible in structure to include many possible disaster scenarios that will be useful to the ultimate end user.

David: the most important thing is to bring the users (UN group) into the lead role; we need a vision and a mission statement. Interactive Scenario with a number of different endings based on actions taken.

Colvin: all groups have a different definition of what means a "disaster" to them. Maybe having the UN participation would be counter-productive.

Helm: invite, but any participant's presence should not be essential

Pelton: Scenario needs a structural mechanism, and it must emerge from this 2002 JUSTSAP meeting.

Crisafulli: the exercise of planning and implementing the Scenario will identify possible disasters, partners, victims, methods, responses, etc.

Colvin: PDC views Scenario as an enabler of cooperation with ADRC, UN, and other DM3 organizations. PDC + ADRC should be put in charge of developing and implementing.

Pelton: Steering Committee attacks financial issue

Gargione: PDC + ADRC have funding; leave it with them. (Confirmed by ADRC)

Day & Helm & Paylor: UN group we are working with is Office of Outer Space Affairs, not the UN Disaster Management Group, although the UN DM3 user group is part of the Bangkok conference.

Suzuki: The Scenario is not a large part of Japan's CRL program. ADRC would be the better vehicle to accomplish it.

Pelton: Establish contacts with appropriate people with participating organizations.

Wood & Ohmori: User voices should be heard early in planning period: Okinawa, Japan government, salvage resources, ADRC, and other parties that have responsibility to respond to disaster, etc.

Stetina: what does PDC & ADRC want from JUSTSAP?

Day: JUSTSAP role is advisory as a facilitator.

Crisafulli: JUSTSAP has already contributed as much as it can until the implementers require advice, facilitation, and ideas.

Wood: ISU began without recognition, and UN Observer status added much to its status. Can JUSTSAP attain that status? ISU's involvement in DM3 and the UN could be an entrée to JUSTSAP following suit. Pelton: Agrees.

VISIT: Maui High Performance Computing Center

Tak Hasimura - The Maui Technology Park was started in the early 1990s, and was occupied by internet and technology small businesses, which eventually folded with the high-tech crash.

Senator Inouye was a strong supporter of the development of high tech on Hawaii. Today, however, there are no private industry successes in the Park.

The Maui Computing Center is one of 22 US Department Of Defense (DOD) Computing Centers. Established in 1993 with Congressional funding, the Center was initially managed by the University of New Mexico for 8 years (1993-2001). The US Air Force offered the Center for re-bid, and a collaboration of the University of Hawaii, Science Applications International, and Boeing Corporation were awarded a 10-year (including option periods), contract to operate the Center from October 2001 - 2011. Funding of \$181 million is to be spread over the 10-year period.

The 30,000 sq. ft. facility houses Computing Center staff and the US Air Force. There are 1,983 processors with capacity of 2.36 Terraflops and 956GB memory.

A graph of Moore's Law since 1993-2001 (doubling computing power every 18 months) illustrated the Computing Center's capacity growth. The Center's programs include warfighter supports, space science support, environmental & ocean science support, and bio-medical applications.

VISIT: University Partnership Association (UPA)

Modeling & simulations include signal & image processing, innovative algorithms, adaptive sensing, informatics & Internet & data services, data stream fusion, visualization, distributive operations.

LLST (Large Synoptic Survey Telescope) is on the drawing board now. A less-costly alternative to LSST is an array of small telescopes = PAN-STARRS, which maps the skies 2 times each week. Maui Computing Center is developing protocols for handling the data, using a budget of \$15 million.

Hawaii has a uniquely heterogeneous gene pool, in sharp contrast to that of Iceland. The science of Bioinformatics measures the growth of the gene bank. Base pairs compared to sequences of DNA. Hawaii's attraction for scientific study relates to its unique gene pool & access to marine biology. There is a \$300 million Bio-Medical Research Center in Honolulu. Conservation biology is a strong field of study in Hawaii.

Communications capability in support of Haleakala telescope facility is supported by fiber cable run to the 10,000 feet summit, and backed up by a microwave station.

VISIT: Pacific Disaster Center (PDC), Maui, Hawaii

PDC began as a consequence of Hurricane Iniki which devastated the island of Kaua'i. History shows that major damaging hurricanes hit the Hawaiian Islands on a 10-year cycle. PDC assisted in the state development of communications infrastructure. PDC's mission includes working with DOD in Humanitarian effort with satellite imagery. PDC also works with FEMA. Most recently PDC merged into a cooperation with the East-West Center in Honolulu.

PDC is has a goal to promote an international focus of technology applications, and its current primary occupation is modeling and forecasting with respect to DM. PDC uses ARC & ESRI modeling software, exclusively. DM is in transition of being factored into the policy lexicon similar to national & global environmental policy 20 years ago.

Stan Goosby of PDC gave a presentation of the Vanatu Tsunami Simulation Project developed on the request of SOPAC, the catastrophic insurance body at the World Bank, which was interested in identifying Fiji's tsunami risk.

Simulation of Port Villa was achieved using a silicon graphics machine plus super computing to express high-resolution visualization. The 6-meter tall tsunami wave reached 200 meters inland. Mele Bay was simulated with a 7-meter tall wave inundating the shore for 1 mile inland over low-lying land & destroyed a squatter village. These simulations took about 3-weeks each to create real-time movie images.

Earthquake simulation is achieved with model software HAZU99. A model scenario of the island of Guam being struck by 7.2 Richter scale earthquake reached 76 km deep under the earth's surface. Such modeling software is used to create Hazard Topographical Maps.

The Dam Break Model scenario utilized Wahiawa Reservoir on Oahu. This is the highest risk dam in the State of Hawaii. The model results provided to agencies responsible for this county, which then develop risk management and evacuation plans.

Ken Burton introduced JUSTSAP visitors to the PDC Website (which is still in development after 9 months of work by 15 personnel). Bernadette gave a presentation of the public website's features, and requested our feedback by clicking on a screen button. www3.pdc.org/iweb/ The information displayed on this site is currently local to Hawaii, but soon it will be global in scope. The data posted is generated by GOES-10 satellite. A separate website is available to subscribers who are disaster managers or emergency response groups. Any subscriber can add locale warnings in the Information Bar at the bottom of the page. The website is set up for a 56K modem transmission.

The website world map is a grid of latitude and longitude, and storms that move west of the 140° meridian become within the tracking area of Hawaii. Non-disaster earthquake information is posted every 24 hours, and activity is updated every 5 minutes. Imagery is provided by LandSat, SPOT, Air Photos. Emergency services, such as fire stations, police stations, hospitals, etc. are identified, and their locations are shown on the map. The website information accessible by registered users can be distributed by the user to others in the emergency management field.

IDSS (Integrated Decision Support System) consists of US military training for Disaster Management & Humanitarian relief response. This system will have a future multi-language capability. The goal is to provide decision-maker tools at the local, regional, etc. levels. Partnership within the US is military, governmental (all levels), and private industry with responsibility for the disaster struck area. CDERA (Caribbean Disaster Emergency Response Agency) will have a system demonstration in January 2003.

VISIT: Video Conference with United Nations (UN) Office of Outer Space Affairs (OOSA) Workshop on Disaster Mangement, Bangkok Thailand, from Pacific Disaster Center, Maui, Hawaii

Jim Crisafulli began with a prepared presentation of JUSTSAP and its missions addressing an auditorium of 40 people at the UN meeting in Bangkok Thailand. Stephen Day described the different roles of JUSTSAP Partners: Japan, US, East-West Center, PDC, ADRC, indicating that JUSTSAP's role is facilitator.

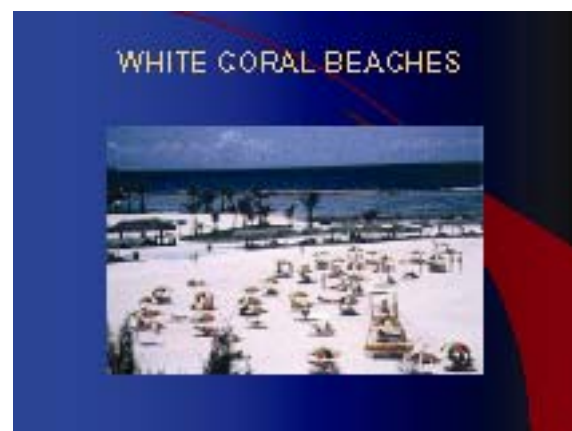
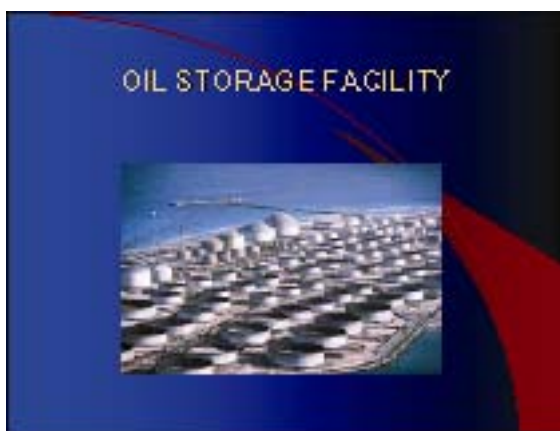
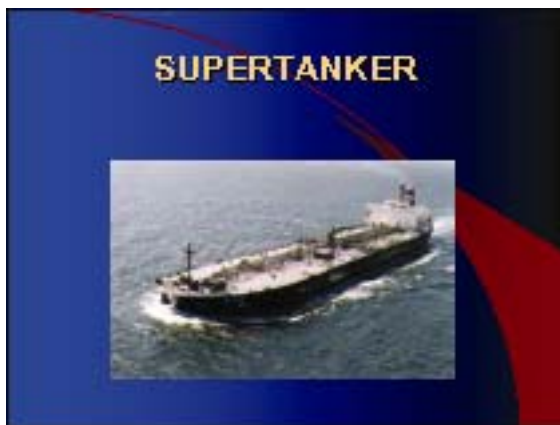
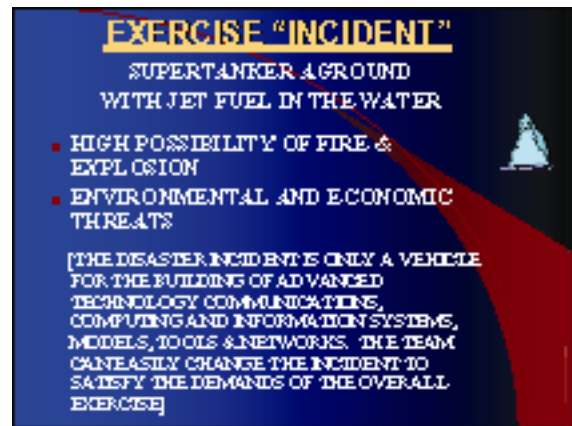
David Stephen took the lead and described the UN Regional Workshop, which has been discussing the use of space technology for DM3 in developing countries, and the development of a Regional Plan of Action of concrete activities to bring space technology into DM3 in the Asia/Pacific Region. Africa and South American Workshops have been completed, and more are planned. Twenty-one hazard areas have been identified that are of personal interest to the UN delegates, such as flood, earthquake and deforestation (the top 3) with the remainder not ranked by preference.

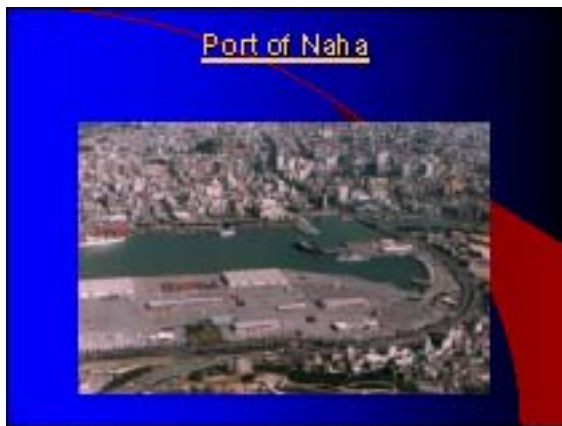
Chat Ascap ? of the UN group remarked that space applications usage in DM3 have been utilized in many countries Asia since 1999. Most of these nations have developed their own local disaster management programs, and some are space faring nations e.g. US, ESA, Japan, India. Regional

organizations such as ADRC have formed and are operational; these organizations are always seeking financial support. The technology is available, but most Asia Pacific countries cannot provide operational DM3 services to each other.

Neil Helm presented details of JUSTSAP's proposed International Disaster Scenario

He noted that variables of technology, tools, models and even disaster types can be changed, as desired. The example Scenario described as a supertanker running aground as a result of a tsunami and spilling jet fuel into the water of the harbor at Okinawa Japan.





EXERCISE TECHNOLOGIES

- SATELLITES - COMMUNICATIONS, REMOTE SENSING, WEATHER
- COMPUTING - HIGH DATA RATE SUPERCOMPUTER, DATA FUSING, OVERLAYS
- INFORMATION - MODELS, DISASTER MANAGEMENT TOOLS
- NETWORKS - SATELLITE, CABLE, BROADBAND, WIRELESS CELLS, INTERNET
- HIGH ALTITUDE PLATFORM WITH TV AND SENSORS

REAL TIME ASSESSMENTS

- FIRE & EXPLOSION OF TANKER
- FIRE & EXPLOSION OF OIL STORAGE FACILITY
- AMOUNT OF OIL IN THE SEA
- INCREASE SPILL POTENTIAL
- MODELS TO WORK FROM
- WEATHER, WIND & SEA
- ENVIRONMENTAL IMPACT
- ABILITY OF RESPONSE TEAM
- TECHNOLOGY ASSETS & TOOLS

INITIAL TEAM MEMBERS

- JUSTSAP WORKING GROUPS
- US - PACIFIC DISASTER CENTER, DISASTER & DEFENSE AGENCIES, INDUSTRY & ACADEMIA
- JAPAN - COMMUNICATIONS RESEARCH LAB, ASIAN DISASTER REDUCTION CENTER, INDUSTRY & ACADEMIA

INVITATION TO NEW MEMBERS

- OPEN TO INTERNATIONAL, REGIONAL, NATIONAL & LOCAL DISASTER AGENCIES, COMM & INFORMATION COMPANIES WITH TECHNOLOGIES AND TOOLS
- ALSO OPEN TO OBSERVERS & INTERNET ACCESS MEMBERS

EXERCISE GOALS

- SUCCESSFUL JUSTSAP WG EXPERIMENT & TRAINING EXERCISE
- DEMONSTRATION OF ADVANCED TECHNOLOGIES FOR DISASTER MANAGEMENT & MITIGATION
- SYNERGY OF TECHNOLOGIES WITH DISASTER MANAGEMENT MODELS & TOOLS
- PARTICIPATION OF LARGE INTERNATIONAL TEAM
- PRODUCE TRAINING AIDS & TECHNICAL DOCUMENTS FOR LEGACY

Helm announced that all members of JUSTSAP organization pay their own way to participation in JUSTSAP programs, and invited the UN Office of Outer Space Affairs into a cooperative participation in the Scenario. Crisafulli suggested a closer relationship between the UN Office of Outer Space Affairs and JUSTSAP, such as JUSTSAP being granted "observer status" with this UN Office, and JUSTSAP granting similar status to UN OOSA. David Stephen agreed that the group would explore this idea, and suggested that JUSTSAP proceed with UN cooperation without waiting for formal UN Observer Status.

Helm discussed the extension of the Scenario time frame to allow for detailed planning and execution and funding to provide for both, and explained the time line. Earnie Paylor recommended a phased approach with stages of development, as an alternative. Crisafulli asked

for the UN OOSA's ideas on time lines, players, scenario structure, etc., then summed up the philosophy of the cooperative effort, concluding that the demonstration was a means to this end. JUSTSAP would like to make a list of desired results from this effort.

Peter Colvin described a similar scenario that Pacific Disaster Center conducted in cooperation with Russia, which resulted in a network of synergistic relationships. PDC had assisted in the development of an understanding of how technologies can be merged to improve existing DM3 efforts in Asia/Pacific countries.

Tamori represented Asia Disaster Recovery Center as receptive to comments regarding the current situation of DM3 in the Asia/Pacific Region in general, and ADRC in particular.

David Stephen indicated that the UN would like to assist DM3 organizations in Asia realize their full potential. From the UN perspective, the proposed DM3 Scenario is a worthy cause that may be granted minimum UN funding. The Bangkok delegates will look at the technology, examine assessments, and consider UN group participation. They will engage in discussion and get input from their group, then report back to JUSTSAP. At the moment, it seems that it will be extremely useful for JUSTSAP to conceive 2 or 3 experimental Scenarios to address as many different disasters. The UN will be willing to provide coordination effort for interested organizations and institutions.

David Stephen informed JUSTSAP that further meetings will convene after the UN meets this afternoon, and anticipated that 10 - 15 institutions will be interested in participating. Another video-conference would be advisable, augmented by e-mail contacts. Principle points of contact at the UN OOSA will be David Stephen & Chat Ascap? Chat believes that broad band is the key to successful collaboration.

DM3 Workshop, Thursday, November 14

Wood: presented "Space Policy" journal, which would be the appropriate venue for publishing the report on the collaboration between JUSTSAP and the UN Office of Outer Space Affairs with respect to DM3.

"Earthquake Damage Detection Using Satellite and Airborne Imageries" by Masashi Matsuoka, Earthquake Disaster Mitigation Research Center, National Research Institute for Earth Science and Disaster Prevention, Hyogo Japan

Evaluation post-disaster can be expensive in human resources. Remote Sensing via satellite is better, cheaper, and more quickly effective. After Kobe 1995 and Kocaeli Turkey 1999, the use of GIS data was adopted and systems for utilizing information were put in place.

Comparisons were made between aerial TV, aerial photography, airborne SAR, Satellite SAR + Optical sensor. The approach to Damage Assessment depends on area to be viewed, and methods utilized were Macro scale estimation with meteorological satellites, intermediate with EOS, and micro scale by helicopter & airplane. Affected area estimated using nighttime imagery is based on the detection of significant reductions or loss of city lights; using DMSP/OLS night images can be taken. Using multi-spectral imagery comparing historical base images to post-disaster images

(after cleaning up light pollution or other atmospheric anomalies) changes are readily observed. LANDSAT images are used. Aerial images are used for visual interpretation.

For large area automated detection for post-event image, unsupervised classification is applied. Quantitative rapid damage survey categorizes individual damage sites by severity of damage. "Supervised" analysis of a small area can be extrapolated to estimate damage to more distant areas. Surprisingly accurate correlation is achieved in a short time within 24 hours.

ADRC may not find it useful to pass along this estimated assessment to countries; ADRC has a training course to local emergency personnel to interpret the raw images. The assessment should remain in the hands of the local authorities.

Gujarat India earthquake January 2001 disaster aerial imagery and satellite imagery was shown. Gujarat showed the need for preparation and planning in the extreme.

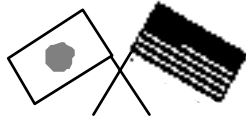
EDES (Early Damaged Area Estimation System)-affected area estimation using nighttime imagery. A web-based automated system providing the estimation result within 1 day after the event. Website: edes.edm.bosai.go.jp/-edes/edm_

Stetina: Steering Committee of outside research organizations is essential to distribute the results of the JUSTSAP Scenario project to the world.

Wood: JUSTSAP contact persons for Scenario with UN OOSA should be ADRC (Hatori), CRL (Suzuki), PDC (Colvin), JUSTSAP secretariat (Crisafulli), JUSTSAP satellite tech (Helm), JUSTSAP DM3 (Day), should have been more clearly defined. Involve Adm. Hayward (Pacific Fleet was his responsibility). Prefecture of Okinawa should be notified up front re: proposed Scenario.

Report of DM3 Accomplishments at Closing Plenary

- Interaction improved = 2 Working Groups + single project; external agencies
- Scenario- described by N. Helm; many specialized SATs collaborated on DM3; broad band Internet & public access Internet
- ADRC & PDC have a mandate to CM3; JUSTSAP will be advisory group to them
- JUSTSAP needs authority of a major organization-David Stephens, UN will find a way JUSTSAP will collaborate with UN OOSA (ultimately achieving "UN Observer Status". Japan's ADPC, NASA Stennis DM3
- Accountability: Colvin PDC; Tamori ADRC; JUSTSAP DM3 Chair
- Tomori working with NASDA & US & JUSTSAP



MINUTES - Steering Committee Meeting #2

**2002 JAPAN-UNITED STATES SCIENCE, TECHNOLOGY
& SPACE APPLICATIONS PROGRAM WORKSHOP**

**Outrigger Waimea Resort
Waimea, Maui
November 15, 2002
Plumeria Room
7:30 a.m.**

Akiba-san opened the meeting.

DM3/SATCOM Report (Stephen Day, Neil Helm, Hatori-san; Suzuki-san)

For the first time, joint symposium. It was very effective. Both groups highly motivated and interactive. All four co-chairs participated.

Scope/Accomplishments/Accountability. 8 presentations plus tour of MHPCC and PDC. Highlight was a video telecon with UN DM conference and Bangkok. 140 attendees in Bangkok.

6 accomplishments:

- highly interactive joint session
- conceptualized scenario involving oil spill with supertanker around Okinawa; substantial human and environmental problem. Goals and objectives to respond to this event with communications technology and infuse and overlay data and make available through Internet to hazard managers in Japan, the United States, and other relevant areas.
- PDC and ADRC established an agreement to lead this simulation project; JUSTSAP will act as an interface; this will not be a "one-time" experiment, but will lead to training aids and other spinoffs that can be used again.
- Video telecon brought UN in as a supporting organization; informal agreement established through the teleconference and previous telephone conferences.
- JUSTSAP's role will be to act as an advisory group that will interact with PDC and ADRC; will also bring in other people in an advisory capacity.
- Other people will participate, such as CRL, NASDA, Okinawa Prefecture, Stennis and other NASA Centers.

Accountability: Peter Colvin from PDC will lead from U.S. side. Hatori-san will be the other anchor. JUSTSAP advisory group will continue support.

Hatori-san thanked the delegates, and stressed the importance of sharing ideas to move joint interests forward.

Also pursuing observer status with UN.

Discussed several advanced satcom programs being planned. Advanced geoplatform work being done by Dr. Pelton with CRL in Japan. Discussion of ACTS experiments. Japan has outdistanced the U.S. dramatically in terms of experimental satellites. High altitude inclined orbit platform also being planned. New topic introduced – air traffic control using satellites. This will supplant the “black box” technologies. CRL voiced continued support for planned scenario. Next meeting will invite a delegate representing air traffic control to participate in discussions.

MICROGRAVITY: (Odawara; Antar) Seven presentations from Japan, 8 from U.S. Good collaboration already established, with the purpose of making collaboration successful – challenge how to raise sufficient funds to support programs. Wish to use the name JUSTSAP to support fund raising for specific projects. There is sufficient recognition now to use this name for support. Problem of funding a real challenge in U.S., given NASA’s current lack of funding support for microgravity research. Plan to recruit more industry for support. [check tape] Japanese side has been far more successful with student experiments. U.S. needs to involve more students.

SPACE POWER (Mankins; Kaya): Over 20 papers presented from NASA, NASDA, and other organizations. Also participated in trip to Haleakala, arranged by Mark Henley from Boeing. Also discussed opportunities for student projects. Also discussed microwave beaming demo between islands, for which they are requesting Hawaii State support to facilitate. Possibilities to promote future JUSTSAP meetings through journals published by organizations such as the IEEE.

Stephen Day voted in as new VC for US, and Peter Colvin as the new co-Chair for the DM3.

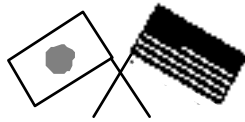
SMALL SATELLITES & LAUNCHERS (Grady): European Broadcast Union would be a good model to study. Feeling that Japan-U.S. nature needs to be preserved.

New working groups – education could be promoted either as a new working group or as a mandated action for reach existing working group. March 29 should be officially recognized as co-sponsor of event at GWU.

Pending funding for the Millennium Village project. Possible funding may come to JUSTSAP through this program (using satellites and IT for distance education).

We need “brand” recognition. Mention “JUSTSAP” in all appropriate venues. Improved Website. Structure PR plan that highlights events like collaboration with UN. Press releases, etc. Pursue incorporation.

Dan Bland: JUSTSAP has provided a unique opportunity for networking. Wants to return 1% of funds from proceeds derived through JUSTSA-initiated projects. Can also gather information through JUSTSAP. We should try to make this unique to attract industry interests. We should target specific industries (like Boeing and Lockheed).



SPEECH BY TOMOHIKO HATORI MORNING, NOVEMBER 15, 2003

Distinguished participants, ladies and gentlemen, It is my great honor to participate to the 2002 JUSTSAP Workshop. First of all, I would like to take this opportunity to express my appreciation for your participation in this meeting.

On behalf of the Asian Disaster Reduction Center and as the co-chairman of DM3, Disaster Monitoring, Management & Mitigation Working Group, I am very pleased with the outcome of the Joint Satellite Communications & Disaster Monitoring, Management & Mitigation Session, particularly the sharing of ideas and views on how we could address the use of satellite for natural disaster management and how we can further strengthen cooperation and collaboration among Japanese and US organizations. Especially, the success of the video teleconference with “United Nations Regional Workshop on the Use of Space Technology for Disaster Management for Asia and the Pacific” at Bangkok would be able to promote multilateral cooperation and network of the various players for disaster management in the Asian-Pacific region.

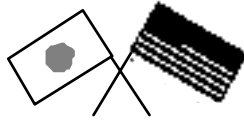
ADRC is aiming the reduction of damages by natural disasters, not man-made disaster. ADRC is still a possible member organization of the “Okinawa oil spill simulation.” However, once a disaster occurred, whichever it was man-made or natural, the emergency responses including information dissemination would take very similar processes. In this regard, I think ADRC has a possibility to contribute to the simulation exercise as a representative of end-users.

International collaboration for disaster reduction is an essential strategy for the sustainable development. ADRC already has connection with NASDA, CRL in Japan and PDC in US in the aspects of natural disaster reduction and response in the Asian-Pacific region. And keep in touch with them and other participating organizations of JUSTSAP for better collaboration.

Once again, I, as the co-chairman of DM3 working group, appreciate your active participation in this meeting and look forward to the success of the next JUSTSAP meeting in Hawaii next year.

Thank you.

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Senior Researcher, Asian Disaster Reduction Center



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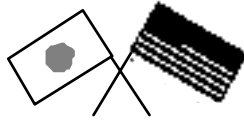
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BYLAWS

ARTICLE I

OFFICES

Section 1.1 **Business Offices.** The principal office of the corporation shall be located in _____, _____. The corporation may have such other offices, either within or outside Hawaii, as the board of directors may designate or as the affairs of the corporation may require from time to time.

Section 1.2 **Registered Office.** The registered office of the corporation required by the Hawaii Nonprofit Corporation Act to be maintained in Hawaii may be, but need not be, the same as the principal office if in Hawaii and the address of the registered office may be changed from time to time by the board of directors or by the officers of the corporation.

ARTICLE II

MEMBERS

Section 2.1 **No Members.** The Corporation shall have no members. The entire voting power for all purposes will rest in the board of directors. The corporation shall have no capital stock. The board of directors may develop one or more classes of persons who may be designated as members solely in recognition of contributions to the corporation. The designation of any such class of members shall be set forth in these bylaws.

ARTICLE III

BOARD OF DIRECTORS

Section 3.1 **General Powers.** The business and affairs of the corporation shall be managed by its board of directors, except as otherwise provided in the Hawaii Nonprofit Corporation Act, the articles of incorporation, or these bylaws.

Section 3.2 **Number, Election, Tenure, and Qualifications.** The number of directors of the corporation shall be nine to fifteen as determined by the board of directors from time to time. Any action of the board of directors to increase or decrease the number of directors, whether expressly, or by resolution, or by implications through the election of additional directors, shall constitute an amendment of these bylaws effecting such increase or decrease. The term of office of each director shall be one year. Directors shall be elected by a vote of the directors at every annual meeting. Each director shall

hold office until such director's term expires and thereafter shall hold office until such director's successor shall have been elected and qualified, or until such director's earlier death, resignation, or removal. Directors must be at least eighteen years old but need not be residents of Hawaii. Directors shall be removable in the manner provided by the statutes of Hawaii.

Section 3.3 **Vacancies**. Any director may resign at any time by giving written notice to the president or to the secretary of the corporation. A director's resignation shall take effect at the time specified in such notice, and unless otherwise specified therein, the acceptance of such resignation shall not be necessary to make it effective. Any vacancy occurring in the board of directors may be filled by the affirmative vote of a majority of the remaining directors though less than a quorum at the next regular meeting. A director elected to fill a vacancy shall be elected for the unexpired term of such director's predecessor in office. Any directorship to be filled by reason of an increase in the number of directors shall be filled by reason of an increase in the number of directors shall be filled by the affirmative vote of a majority of the directors then in office, and a director so chosen shall hold office until the next election of directors and thereafter until such director's successor shall have been elected and qualified, or until such director's earlier death, resignation, or removal.

Section 3.4 **Regular Meetings**. A regular meeting of the board of directors shall be held annually at the time and place, either within or outside Hawaii, determined by the board, for the purpose of electing officers and for the transaction of such other business as may come before the meeting. The board of directors may provide by resolution the time and place, either within or outside Hawaii, for the holding of additional regular meetings.

Section 3.5 **Special Meetings**. Special meetings of the board of directors may be called by or at the request of the president or any two directors. The person or persons authorized to call special meetings of the board of directors may fix any place as the place, either within or outside Hawaii, for holding any special meeting of the board called by them.

Section 3.6 **Notice**. Notice of each meeting of the board of directors stating the place, day, and hour of the meeting shall be given to each director at such director's business address at least five days prior thereto by the mailing of written notice by first class, certified, or registered mail, or at least two days prior thereto by personal delivery of written notice or by telephonic, telegraphic, electronic mail, or facsimile notice. The method of notice need not be the same as to each director. If mailed, such notice shall be deemed to be given when deposited in the United States mail, with postage thereon prepaid. If transmitted by electronic mail or facsimile, such notice shall be deemed to be given when the transmission is completed. Any director may waive notice of any meeting before, at or after such meeting. The attendance of a director at a meeting shall constitute a waiver of notice of such meeting, except where a director attends a meeting for the express purpose of objecting to the transaction of any business because the meeting is not lawfully called or convened. Neither the business to be transacted at, nor the purpose of, any meeting of the board of directors need be specified in the notice or waiver or notice of such meeting unless otherwise required by statute.

Section 3.7 **Presumption of Assent**. A director of the corporation who is present at a meeting of the board of directors at which action on any corporate matter is taken shall be presumed to have assented the action taken unless such director's dissent or abstention shall be entered in the minutes of the meeting or unless such director shall file a written dissent or abstain to such action with the person acting as the secretary of the meeting before the adjournment thereof or shall forward such dissent by registered mail to the secretary of the corporation immediately after the adjournment of the meeting. Such right to dissent shall not apply to a director who voted in favor of such action.

Section 3.8 **Quorum and Voting.** A majority of the directors and any appointed Chairs of Committees shall constitute a quorum for the transaction of business at any meeting of the board of directors, and the vote of a majority of the directors present in person at a meeting at which a quorum is present shall be the act of the board of directors. If less than a quorum is present at a meeting, a majority of the directors present may adjourn the meeting from time to time without further notice other than an announcement at the meeting, until a quorum shall be present. No director may vote by proxy at any meeting of directors.

Section 3.9 **Compensation.** Directors shall not receive compensation for their services as such, although the reasonable expenses of directors of attendance at board meeting may be paid or reimbursed by the corporation. Directors shall not be disqualified to receive reasonable compensation for services rendered to or for the benefit of the corporation in any other capacity.

Section 3.10 **Executive and Other Committees.** By one or more resolutions adopted by a majority of the directors then in office, the board of directors may designate from an executive committee of not less than five (5) persons, which may include Committee Chairs. By resolution, the directors can establish one or more other committees, each of which, to the extent provided in the resolution establishing such committee, shall have and may exercise all of the authority of the board of directors, except as prohibited by statute. The delegation of authority to any committee shall not operate to relieve the board of directors or any member of the board from any responsibility imposed by law. Rules governing procedures for meetings of any committee of the board of directors shall be as established by the board, or in the absence thereof, by the committee itself.

Section 3.11 **Meetings by Telephone.** Members of the board of directors or any committee thereof may participate in a meeting of the board or committee by means of conference telephone or similar communications equipment by which all persons participating in the meeting can hear each other at the same time. Such participation shall constitute presence in person at the meeting.

Section 3.12 **Action without a Meeting.** Any action required or permitted to be taken at a meeting of the directors or any committee thereof may be taken without a meeting if a consent in writing, setting forth the action so taken, shall be signed by all of the directors or committee chairs entitled to vote with respect to the subject matter thereof. Such consent (which may be signed in counterparts) shall have the same force and effect as a unanimous vote of the directors or committee members.

ARTICLE IV

OFFICERS AND AGENTS

Section 4.1 **Number and Qualifications.** The elected officers of the corporation shall be a president, one or more vice-presidents, a secretary, and a treasurer. The board of directors may also appoint such other officers, assistant officers, and agents, including an executive director, a controller, assistant secretaries, and assistant treasurers, as it may consider necessary. One person may hold more than one office at a time, except that no person may simultaneously hold the offices of president and secretary. Officers need not be directors of the corporation. All officers must be at least eighteen years old.

Section 4.2 **Election and Term of Office**. The elected officers of the corporation shall be elected by the board of directors annually. If the election of officers shall not be held at such meeting, such election shall be held as soon as convenient thereafter. Each officer shall hold office until such officer's successor shall have been duly elected and shall have qualified, or until such officer's earlier death, resignation, or removal.

Section 4.3 **Compensation**. The compensation of the officers, if any, shall be as fixed from time to time by board of directors, and no officer shall be prevented from receiving a salary by reason of the fact that such officer is also a director of the corporation. However, during any period in which the corporation is a private foundation as described in section 509 (a) of the Internal Revenue Code, no payment of compensation (or payment or reimbursement of expenses) shall be made in any manner so as to result in the imposition of any liability under section 4941 of the Internal Revenue Code.

Section 4.4 **Removal**. Any officer or agent may be removed by the board of directors whenever in its judgment the best interest of the corporation will be served thereby, but such removal shall be without prejudice to the contract rights, if any, of the person so removed. Election or appointment of an officer or agent shall not in itself create contract rights.

Section 4.5 **Vacancies**. Any officer may resign at any time, subject to any rights or obligations under any existing contracts between the officer and the corporation, by giving written notice to the president or to the board of directors. An officer's resignation shall take effect at the time specified in such notice, and unless otherwise specified therein, the acceptance of such resignation shall not be necessary to make it effective. A vacancy in any office, however occurring, may be filled by the board of directors for the unexpired portion of the term. If a person becomes disabled, resigns, or dies then the majority of the board of directors at a special meeting called for that purpose shall re-elect that office or other offices.

Section 4.6 **Authority and Duties of Officers**. The officers of the corporation shall have the authority and shall exercise the powers and perform the duties specified below and as may be additional specified by the president, the board of directors, or these bylaws, except that in any event each officer shall exercise such powers and perform such duties as may be required by law.

(a) **President**. The president shall, subject to the direction and supervision of the board of directors: (i) be the chief executive officer of the corporation and have general and active control of its affairs and business and general supervision of its officer and agents (ii) preside at all meetings of the board of directors; (iii) see that all orders and resolutions of the board of directors are carried into effect; and (iv) perform all other duties incident to the office of president and as from time to time may be assigned to such office by the board of directors.

(b) **Vice-presidents**. The vice-president or vice presidents shall assist the president and shall perform such duties as may be assigned to them by the president or by the board of directors. The vice-president (or if there is more than one, then the vice-president designated by the board of directors, or if there is no such designation, then the vice-presidents in order of their election) shall, at the request of the president, or in the president's absence or inability or refusal to act, perform the duties of the president and when so acting shall have all the powers of and be subject to all the restrictions on the president.

(c) **Secretary**. The secretary shall (i) keep the minutes of the proceedings of the board of

directors and any committees of the board; (ii) see that all notices are duly given in accordance with the provisions of these bylaws or as required by law (iii) be custodian of the corporate records and of the seal of the corporation; (iv) keep at the corporation's registered office or principal place of business within or outside Hawaii a record containing the names and address of all members, if any and (v) in general, perform all duties incident to the office of secretary and such other duties as from time to time may be assigned to such office by the president or by the board of directors. Assistant secretaries, if any, shall have the same duties and powers, subject to supervision by the secretary.

(d) Treasurer. The treasurer shall (i) be the principal financial officer of the corporation and have the care and custody of all its funds, securities, evidence of indebtedness, another personal property and deposit the same in accordance with the instructions of the board of directors; (ii) receive and give receipts and acquittances for moneys paid on account of the corporation, and pay out of the funds on hand all bills, payrolls, and other just debts of the corporation of whatever nature upon maturity; (iii) unless there is a controller, be the principal accounting officer of the corporation and as such prescribe and maintain the methods and systems of accounting to be followed, keep complete books and records of account, prepare and file all local, state, and federal tax returns and related documents, prescribe and maintain an adequate system of internal audit, and prepare and furnish to the president and the board of directors statements of account showing the financial position of the corporation and the results of its operations; (iv) upon request of the board, make such reports to it as may be required at any time; and (v) perform all other duties incident to the office of treasurer and such other duties as from time to time may be assigned to such office by the president or the board of directors. Assistant treasurers, if any, shall have the same powers and duties, subject to supervision by the treasurer.

Section 4.7 **Surety Bonds**. The board of directors may require any officer or agent of the corporation to execute to the corporation a bond in such sums and with such sureties as shall be satisfactory to the board, conditioned upon the faithful performance of such person's duties and for the restoration to the corporation of all books, papers, vouchers, money, and other property of whatever kind in such person's possession or under such person's control belonging to the corporation. If required, the corporation will pay for such surety bonds premiums.

ARTICLE V

INDEMNIFICATION

Section 5.1 **Definitions**. For purpose of this Article, the following terms shall have the meanings set forth below.

(a) "Corporation" means the corporation and, in addition to the resulting or surviving corporation, any domestic or foreign predecessor entity of the corporation in a merger, consolidation, or other transaction in which the predecessor's existence ceased upon consummation of the transaction.

(b) "Expenses" means the actual and reasonable expenses, including attorneys' fees, incurred by a party in connection with a proceeding.

(c) "Liability" means the obligation to pay a judgment, settlement, penalty, fine (including an excise tax assessed with respect to a private foundation or an employee benefit plan), or expense incurred with respect to a proceeding.

(d) "Official capacity" when used with respect to a director of the corporation means the office of director in the corporation, and when used with respect to a person in a capacity other than as a director (even if such person is also a director) means the office in the corporation held by the officer or the employment relationship undertaken by the employee on behalf of the corporation in the performance of his or her duties in his or her capacity as such officer or employee. "Official capacity" does not include service for any other foreign or domestic corporation or for any partnership, joint venture, trust, other enterprise, or employee benefit plan when acting directly on behalf of such other corporation, partnership, joint venture, trust, enterprise, or plan as a director, officer, employee, fiduciary, or agent thereof.

(e) "Party" means any person who was, is, or is threatened to be made, a named defendant or respondent in a proceeding by reason of the fact that such person is or was a director, officer, or employee of the corporation, and any person who, while a director, officer, or employee of the corporation, is or was serving at the request of the corporation as a director, officer, partner, trustee, employee, fiduciary, or agent of any other foreign or domestic corporation or of any partnership, joint venture, trust, other enterprise, or employee benefit plan. A party shall be considered to be serving an employee benefit plan at the corporation's request if such party's duties to the corporation also impose duties on or otherwise involve services by such party to the plan or to participants in or beneficiaries of the plan.

(f) "Proceeding" means any threatened, pending, or completed action, suit, or proceeding, or any appeal therein, whether civil criminal, administrative, arbitative, or investigative (including an action by or in the right of the corporation) and whether formal or informal.

Section 5.2 **Right to Indemnification.**

(a) Standards of Conduct. Except as provided in Section 5.2 (d) below, the corporation shall indemnify and party to a proceeding against liability incurred in or as a result of the proceeding if (i) such party conducted himself or herself in a good faith, (ii) such party reasonably believed (a) in the case of a director acting in his or her official capacity, that his or her conduct was in the corporation's best interest, or (b) in all other cases, that such party's conduct was at least not opposed to the corporation's best interests, and (iii) in the case of any criminal proceeding, such party had no reasonable cause to believe his or her conduct was unlawful. For purposes of determining the applicable stand of conduct under this Section 5.2, any party acting in his or her official capacity who is also a director of the corporation shall be held to the standard of conduct set forth in Section 5.2 (a) (ii) (a), even if such party is sued solely in a capacity other than as such director.

(b) Employee Benefit Plans. A party's conduct with respect to an employee benefit plan for a purpose such party reasonable believed to be in the interests of the participants in or beneficiaries of the plan is conduct that satisfies the requirements of Section 5.2 (a) (ii) (b). A party's conduct with respect to an employee benefit plan for a purpose that such party did not reasonably believe to be in the interests of the participants in or beneficiaries of the plan shall be deemed not to satisfy the requirements of Section 5.2 (a) (i).

(c) Settlement. The termination of any proceeding by judgment, order, settlement, or conviction, or upon a plea of nolo contendere or its equivalent, is not of itself determinative that the party did not meet the applicable standard of conduct set forth in Section 5.2 (a).

(d) Indemnification Prohibited. Except as hereinafter set forth in this Section 5.2 (d), the corporation may not indemnify a party under this Section 5.2 either (i) in connection with a proceeding by or in the right of the corporation in which the party is or has been adjudged liable for gross negligence or willful misconduct in the performance of the party's duty to the corporation, or (ii) in connection with any proceeding charging improper personal benefit to the party, whether or not involving action in the party's official capacity, in which the party was adjudged liable on the basis that personal benefit was improperly received by the party (even if the corporation was not thereby damaged). Notwithstanding the foregoing, the corporation shall indemnify and such party if and to the extent required by the court conducting the proceeding, or any other court of competent jurisdiction to which the party has applied, if it is determined by such court, upon application by the party, that despite the adjudication of liability in the circumstances in classes (i) and (ii) of this Section 5.2 (d) or whether or not the party met the applicable standard of conduct set forth in Section 5.2 (a), and in view of all relevant circumstances, the party is fairly and reasonable entitled to indemnification for such expenses as the court deems proper in accordance with the Hawaii Nonprofit Corporation Act.

(e) Claims by or in the Right of Corporation. Indemnification permitted under this Section 5.2 in connection with a proceeding by or in the right of the corporation shall be limited to expensed incurred in connection with the proceeding.

(f) Combined Proceedings. If any claim made by or in the right of the corporation against a party is joined with any other claim against such party in a single proceeding, the claim by or in the right of the corporation (and all expenses related thereto) shall nevertheless be deemed the subject of a separate and distinct proceeding for purposes of this Article.

Section 5.3 Prior Authorization Required. Any indemnification under Section 5.2 (unless order by a court) shall be made by the corporation only if authorized in the specific case after a determination has been made that the party is eligible for indemnification in the circumstances because the party has met the applicable standard of conduct set forth in Section 5.2 (a) and after an evaluation has been made as to the reasonableness of the expenses. Any such determination, evaluation, and authorization shall be made by the board of directors by a majority vote of a quorum of such board, which quorum shall consist of directors not parties to the subject proceeding, or by such other person or body as permitted by law.

Section 5.4 Success on Merits or Otherwise. Notwithstanding any other provision of this Article, the corporation shall indemnify a party to the extent such party has been successful, on the merits or otherwise, including without limitation, dismissal without prejudice or settlement without admission of a liability, in defense of any proceeding to which the party was a party against expenses incurred by such party in connection therewith.

Section 5.5 Advancement of Expenses. The corporation shall pay for or reimburse the expenses, or a portion thereof, incurred by a party in advance of the final disposition of the proceeding if: (a) the party furnishes the corporation a written affirmation of such party's good-faith belief that he or she has met the standard of conduct described in Section 5.2 (a) (i) while conducting activities on behalf of the corporation; (b) the party furnishes the corporation a written undertaking, executed personally or on behalf of such party, to repay the advance if it is ultimately determined that the party did not meet such standard of conduct; and (c) authorization of payment and a determination that the facts then known to those making the determination would not preclude indemnification under this Article have been made in the manner provided in Section 5.3. The undertaking required by clause (b) must be an unlimited general obligation of the party, but need not be secured and may be accepted without reference

to financial ability to make repayment.

Section 5.6 Payment Procedures. The corporation shall promptly act upon any request for indemnification, which request must be in writing and accompanied by the order of court or other reasonably satisfactory evidence documenting disposition of the proceeding in the case of indemnification under Section 5.4 and by the written affirmation and undertaking to repay as required by Section 5.5 in the case of indemnification under such Section. The right to indemnification and advances granted by this Article shall be enforceable in any court of competent jurisdiction if the corporation denies the claim, in whole or in part, or if no disposition of such claim is made within ninety days after written request for indemnification is made. A party's expenses incurred in connection with successfully establishing such party's right to indemnification, in whole or in part, in any such proceeding shall also be paid by the corporation.

Section 5.7 Insurance. By action of the board of directors, notwithstanding any interests of the directors in such action, the corporation may purchase and maintain insurance in such amounts as the board of directors deems appropriate to protect itself and any person who is or was a director, officer, employee, fiduciary, or agent of the corporation, or who, while a director, officer, employee, fiduciary, or agent of the corporation, is or was serving at the request of the corporation as a director, officer, partner, trustee, employee, fiduciary, or agent of and other foreign or domestic corporation or of any partnership, joint venture, trust, other enterprise, or employee benefit plan against any liability asserted against or incurred by such person in any such capacity or arising out of such person's status as such, whether or not the corporation would have the power to indemnify such person against such liability under applicable provisions of law or this Article. Any such insurance may be procured from any insurance company designated by the board of directors, whether such insurance company is formed under the laws of Hawaii or any other jurisdiction, including any insurance company in which the corporation has an equity or any other interest, through stock ownership or otherwise. The corporation may create a trust fund, grant a security interest, or use other means (including, without limitation, a letter of credit) to ensure the payment of such sums as may become necessary to effect indemnification as provided therein.

Section 5.8 Right to Impose Conditions to Indemnification. The corporation shall have the right to impose, as conditions to any indemnification provided or permitted in this Article, such reasonable requirements and conditions as may appear appropriate to the board of directors in each specific case and circumstances, including but not limited to any one or more of the following: (a) that any counsel representing the party to be covered by payment of counsel fees in connection with the defense or settlement of any claim or proceeding made, initiated, or threatened against this party; (b) that the corporation shall have the right, at its option, to assume and control the defense or settlement of any claim or proceeding made, initiated, or threatened against the party to be indemnified; and (c) that the corporation shall be subrogated, to the extent of any payments made by way of indemnification, to all of the indemnification party's right of recovery, and that the party to be indemnified shall execute all writings and do everything necessary to assure such rights of subrogation to the corporation.

Section 5.9 Other Right and Remedies. Except as limited by law, the indemnification provided by this Article shall be in addition to any other rights which a party may have or hereafter acquire under any law, provision of the articles of incorporation, any other or future provisions of these bylaws, vote of the board of directors, agreement, or otherwise.

Section 5.10 Applicability: Effect. The indemnification provided in this Article shall be applicable to acts or omissions that occurred prior to the adoption of this Article, shall continue as to any

party entitled to indemnification under this Article who has ceased to be a director, officer, or employee of the corporation or, at the request of the corporation, was serving as and has since ceased to be a director, officer, partner, trustee, employee, fiduciary, or agent of any other domestic or foreign corporation, or of any partnership, joint venture, trust, other enterprise, or employee benefit plan, and shall inure to the benefit of the estate and personal representatives of each such person. The repeal or amendment of this Article or of any section or provision thereof that would have the effect of limiting, qualifying, or restricting any of the powers or rights of indemnification provided or permitted in this Article shall not, solely by reason of such repeal or amendment, eliminate, restrict, or otherwise affect the right or power of the corporation to indemnify any person, or affect any right of indemnification of such person, with respect to any acts or omissions that occurred prior to such repeal or amendment. All rights to indemnification under this Article shall be deemed to be provided by a contract between the corporation and each party covered hereby.

Section 5.11 **Indemnification of Agents**. The corporation shall have the right, but shall not be obligated, to indemnify any agent of the corporation not otherwise covered by this Article to the fullest extent permissible by the laws of Hawaii. Unless otherwise provided in any separate indemnification arrangement, any such indemnification shall be made only as authorized in the specific case in the manner provided in Section 5.3.

Section 5.12 **Savings Clause: Limitation**. If this Article or any section or provision thereof shall be invalidated by any court on any ground, then the corporation shall nevertheless indemnify each party otherwise entitled to indemnification here under to the fullest extent permitted by law or any applicable provision of this Article that shall not have been invalidated. Notwithstanding any other provision of these bylaws, the corporation shall neither indemnify any person nor purchase any insurance in any manner or to any extent that would jeopardize or be inconsistent with the qualification of the corporation as an organization described in section 501 (c) (3) of the Internal Revenue Code, or that would result in the imposition of any liability under section 4941 of the Internal Revenue Code.

ARTICLE VI

MISCELLANEOUS

Section 6.1 **Account Books, Minutes, Etc.** The corporation shall keep correct and complete books and records of account and shall keep minutes of the proceedings of the board of directors and committees. All books and records of the corporation may be inspected by any director or such person's authorized agent or attorney, for any proper purpose at any reasonable time.

Section 6.2 **Fiscal Year**. The fiscal year of the corporation shall be established by the board of directors.

Section 6.3 **Conveyances and Encumbrances**. Property of the corporation may be assigned, conveyed, or encumbered by such officers of the corporation as may be authorized to do so by the board of directors, and such authored persons shall have power to execute and deliver any and all instruments of assignment, conveyance, and encumbrance; however, the sale, exchange, lease or other disposition of all or substantially all of the property and assets of the corporation shall be authorized only in the manner prescribed by applicable statute.

Section 6.4 **Designated Contributions**. The corporation may accept any designated contributions, grant, bequest, or devise consistent with its general tax-exempt purposes, as set forth in the articles of incorporation. As so limited, donor-designated contributions will be accepted for special funds, purposes or uses, and such designations generally will be honored. However, the corporation shall reserve all right, title, and interest in and to and control of such contributions, as well as full discretion as to the ultimate expenditure or distribution thereof in connection with any such special fund, purpose, or use. Further, the corporation shall acquire and retain sufficient control over all donated funds (including designated contributions) to assure that such funds will be used to carry out the corporation's tax-exempt purposes.

Section 6.5 **Conflicts of Interest**. If any person who is a director or officer of the corporation is aware that the corporation is about to enter into any grant application, funding relationship, or business transaction directly or indirectly with such person, any member of such person's family, or any entity in which such person has any legal, equitable, or fiduciary interest or position, including without limitation as a director, officer, shareholder, partner, beneficiary, or trustee, such person shall: (a) immediately inform those charged with approving the transaction on behalf of the corporation of such person's interest or position; (b) aid the persons charged with making the decision by disclosing any material facts within such person's knowledge that bear on the advisability of such transaction from the standpoint of the corporation; and (c) not be entitled to vote on the decision to enter into such transaction.

Section 6.6 **Loans to Directors and officers Prohibited**. No loans shall be made by the corporation to any of its directors or officers. Any director or officer who assents to or participates in the making of any such loan shall be liable to the corporation for the amount of such loan until it is repaid.

Section 6.7 **References to Internal Revenue Code**. All references in these bylaws to provisions of the Internal Revenue Code are to the provisions of the Internal Revenue Code of 1986, as amended, and to the corresponding provisions of any subsequent federal tax laws.

Section 6.8 **Amendments**. The power to alter, amend, or repeal these bylaws and adopt new bylaws shall be vested in the board of directors; provided, however, that no change to these bylaws shall limit or repeal the voting rights of any class of membership unless such change is adopted by the affirmative vote of a majority of the members of such class. Proposed amendments shall be submitted in written form to all directors at least 30 days prior to a regular meeting. Acceptance, amending, or rejection shall be by the voting rules of Section 3.8.

Section 6.9 **Severability**. The invalidity of any provision of these bylaws shall not affect the other provisions hereof, and in such event these bylaws shall be construed in all respects as if such invalid provisions were omitted.

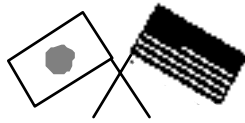
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BYLAWS CERTIFICATE

The undersigned certifies that he/she is the Secretary of Japan-United States Science, Technology and Space Applications Program, a Hawaii nonprofit corporation, and that, as such, he/she is authorized to execute this certificate on behalf of said corporation, and further certifies that attached hereto is a complete and correct copy of the presently effective bylaws of said corporation.

Date: _____, _____.

_____, Secretary



ARTICLES OF ADMINISTRATION

(DRAFT - FROM 1995)

Article 1: Name

- (a) The name of this program shall be "The Japan-U.S. Science & Technology Applications Program," or JUSSTAP. Its Secretariat shall serve as its Administrative Office and shall be located within the Department of Business, Economic Development & Tourism, State of Hawaii.

Article 2: Mission Statement

The objectives of this program shall be as follows:

- (a) To facilitate bilateral cooperation in the exchange of information concerning science and technology activities in Japan and the United States involving governmental organizations, industry, and universities in both countries.
- (b) To undertake cooperative bilateral research and development projects, particularly those that provide scientific, technological, social and/or economic benefits to the Asia-Pacific region.
- (c) To extend the scientific and technological benefits of this collaborative process to nations throughout the world, with an emphasis on addressing the critical socio-economic needs of the Asia-Pacific region.

Article 3: Participants and Dues

- (a) In order to participate in this program, an individual shall first require a letter of invitation from the program Steering Committee, as defined in Article 5, and then shall indicate in writing his/her intention to join the program.
- (b) Participants may join the program as individuals, without necessarily representing the organizations for which they work.
- (c) No dues shall be charged. Traveling expenses and/or out-of-pocket reimbursements for participants shall not be paid, other than for domestic expenses as deemed necessary by the Steering Committee, as defined in Article 5.

Article 4: Working Groups

- (a) In order to accomplish the objectives of this program, Working Groups may be established upon approval by the Steering Committee, as defined in Article 5.

- (b) Two Co-chairmen shall be selected for each Working Group on the basis of one (1) from each country. The names of the selected Co-Chairmen shall be reciprocally notified to Working Group members in each country.
- (c) The number of members of each Working Group shall be divided approximately equally between Japan and the United States, and shall be selected through discussions between the two Co-Chairmen of each Working Group. Membership lists for each Working Group shall be reciprocally distributed to members in each country.
- (d) In the event of a change in the Working Group membership, immediate reciprocal notification shall be made by the Co-Chairmen.
- (e) The activities of the Working Groups shall be left to the discretion of the Working Group Co-Chairmen and shall be coordinated by the Steering Committee.

Article 5: Steering Committee

- (a) In an effort to ensure continuity in the operation of this program, a Steering Committee shall be established.
- (b) The Steering Committee shall consists of three (3) members selected from participants from Japan and three (3) members selected from participants from the United States.
- (c) The method for selecting members of the Steering Committee shall be devised separately by each country.
- (d) In the event of a change in Committee membership, immediate reciprocal notification shall be made for the purpose of approval.
- (e) The Steering Committee shall discuss matters of consequence to this program and, when necessary and upon agreement by the members of both countries, shall hold a meeting at a suitable time and place, with a minimum of one (1) Committee Meeting to be held each year at the General Meeting described in Article 8.

Article 6: Chairman and Vice-Chairmen

- (a) One Chairman and two Vice-Chairmen shall be appointed to the Steering Committee.
- (b) The Chairman and Vice-Chairmen shall be selected from the Steering Committee by members of the Steering Committee.
- (c) The position of Chairman shall alternative between Japan and the United States. Japan and the United States shall each appoint one Vice Chairman in support of the Chairman.
- (d) The Chairman shall be the official representative of both the Steering Committee and the program. In the event the Chairman must withdraw from this position or is otherwise unable to serve, either of the two Vice-Chairmen shall replace the Chairman, as determined through discussions between the two Vice-Chairmen.

- (e) The terms of office of the Chairman and Vice-Chairmen shall be two (2) years, which may be extended through mutual agreement by Steering Committee members from both countries.
- (f) The Chairman shall represent his native country, and the Vice-Chairman from the other country shall represent his native country.

Article 7: Advisors

- (a) Advisors may be appointed to serve in this program, and each country shall immediately notify the other country of such appointments.
- (b) Advisors shall provide professional recommendations with regard to the method of operation of this program whenever necessary.
- (c) The number of Advisors shall be approximately equal between Japan and the United States.

Article 8: General Meeting

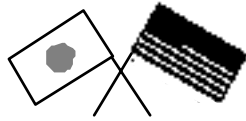
- (a) A General Meeting of JUSSTAP shall be held one (1) time during every twelve (12) to eighteen (18) month period; and as a rule, the General Meeting shall be held in the State of Hawaii, United States of America.

Article 9: Operation Costs

- (a) With regard to the activities undertaken through this program, as a rule there shall be no exchange of money between Japan and the United States.
- (b) The expenses incurred by each country shall be covered by the respective country incurring the expense. Therefore, preparation costs, mailing expenses, travel expenses, and similar costs shall be borne by the individual participants of each country.
- (c) Expenses commonly incurred by both Japan and the United States shall be shared whenever necessary, based upon mutual agreement among members of the Steering Committee.

Article 10: Other Matters

- (a) Administrative assistance required to undertake this program shall be performed in Japan and the United States as necessary, and shall be coordinated by the Secretariat in Honolulu.
- (b) The Steering Committee shall decide on matters not ruled on under these Articles of Administration.



ARTICLES OF INCORPORATION

(DRAFT)

The undersigned natural person, acting as incorporator, hereby establishes a nonprofit corporation pursuant to the Hawaii Non-profit Corporation Act and adopts the following Articles of Incorporation.

FIRST: Name. The name of the corporation is Japan-United States Science, Technology & Space Applications Program

SECOND: Duration. The corporation shall have perpetual existence.

THIRD: (a) Purposes: The corporation is organized and shall be operated exclusively for charitable and educational purposes within the meaning of section 501 (c) (3) of the Internal Revenue Code. The corporation's principal purposes are to _____

(b) Powers. In furtherance of the foregoing purposes and objectives (but not otherwise) and subject to the restrictions set forth in section (c) of this article, the corporation shall have and may exercise all of the powers now or hereafter conferred upon non-profit corporations organized under the laws of Hawaii and may do everything necessary or convenient for the accomplishment of any of the corporate purposes, either alone or in connection with other organizations, entities or individuals, and either as principal or agent, subject to such limitations as are or may be prescribed by law.

(c) Restrictions On Powers.

(1) No part of the net earnings of the corporation shall inure to the benefit of or be distributable to any director or officer of the corporation, or any other individual (except that reasonable compensation may be paid for services rendered to or for the benefit of the corporation affecting one or more of its purposes) and no director or officer of the corporation, or any other individual, shall be entitled to share in any distribution of any of the corporate assets on dissolution of the corporation or otherwise.

(2) No substantial part of the activities of the corporation shall consist of carrying on propaganda or otherwise attempting to influence legislation. However, if the corporation is an organization to which section 501 (h) of the Internal revenue Code applies and the corporation has effectively elected to have such section apply, the corporation shall have the power to carry on the activities permitted by such section, but only to the extent such activities shall not result in the denial of exemption under such section. The corporation shall not participate or intervene in (including the publishing or distribution of statements) any political campaign on

behalf of or in opposition to any candidate for public office.

(3) Upon dissolution of the corporation, all of the corporation's assets remaining after payment of or provision for all of its liabilities shall be paid over or transferred to one or more exempt organizations described in section 501 (c) (3) of the Internal Revenue Code, contributions to which are deductible under section 170 (c) (2) of the Internal Revenue Code. The organizations to receive such property shall be designated by the Board of Directors.

(4) Notwithstanding any other provision of these articles of incorporation, the corporation shall not carry on any activities not permitted to be carried on by a corporation exempt from federal income tax as an organization described in section 501 (c) (3) of the Internal Revenue Code or by a corporation, contributions to which are deductible under section 170 (c) (2) of the Internal Revenue Code.

(5) During any period of time in which the corporation is a "private foundation" as defined in section 509 (a) of the Internal Revenue Code:

(i) The corporation shall not engaged in any act of "self-dealing", as defined in section 4941(d) of the Internal Revenue Code, so as to give rise to any liability for the tax imposed by section 4941(a) of the Internal Revenue Code:

(ii) The corporation shall make distributions for each taxable year at such time and in such manner so as not to become subject to the tax imposed by section 4942 (a) of the Internal Revenue Code:

(iii) The corporation shall not retain any "excess business holdings", as defined in section 4943 (c) of the Internal Revenue Code, so as to give rise to any liability or the tax imposed by section 4943 (a) of the Internal Revenue Code;

(iv) The corporation shall not make any investments that would jeopardize the carrying out of any of the exempt purposes of the corporation, within the meaning of section 4944 of the Internal Revenue Code, so as to give rise to any liability for tax imposed by section 4944 (a) of the Internal Revenue Code; and

(v) The corporation shall not make any "taxable expenditure", as defined in section 4945 (d) of the Internal Revenue Code, so as to give rise to any liability or the tax imposed by section 4945 (a) of the Internal Revenue Code.

All reference in these article of incorporation to provisions of the Internal Revenue Code are to the provisions of the Internal Revenue Code of 1986, as amended, and to the corresponding provisions of any subsequent federal tax laws.

FOURTH: Registered Office and agent. The address of the initial registered office of the corporation is _____. The name of its initial registered agent at such address is _____.

FIFTH: Members. The corporation shall have such classes of nonvoting members as may from time to time be prescribed by its bylaws. The designation of each class and their manner of election or apportionment, qualifications, tenure, terms of membership, rights, powers, privileges and immunities shall be as from time to time stated in the bylaws. Members shall have no voting powers. The corporation shall have no capital stock.

SIXTH: Nondiscriminatory Policy. The corporation shall make its services, facilities, and programs available to all persons regardless of race, color, creed, national origin, sex, or handicap and the corporation shall not in any way discriminate against any person on these grounds.

SEVENTH (a) Board of Directors. The management of the affairs of the corporation shall be vested in a Board of Directors, except as otherwise provided in the Hawaii Nonprofit Corporation Act, these articles of incorporation, or the bylaws of the corporation. The number of directors, their classifications, if any, their terms of office, and the manner of their election or appointment shall be determined according to the bylaws of the corporation from time to time in force.

(b) Right to Indemnification. Directors will be indemnified and will not be liable to third parties for activities done on behalf of this corporation as set forth in the Hawaii Nonprofit Corporation Act.

(c) Liability of Directors. No director shall be personally liable to the corporation for monetary damages for any breach of fiduciary duty as a director, except that the foregoing shall not eliminate or limit such director's liability to the corporation for monetary damages for the following: (1) any breach of such director's duty of loyalty to the corporation; (2) any of such director's acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law; (3) acts specified in C.R.S. Section 7-24-111, as it now exists or hereafter may be amended (regarding a director's assent to or participation in the making of any loan by the corporation to any director or officer of the corporation); or (4) any transaction from which such director derived a personal benefit. If the Hawaii Nonprofit Corporation Act hereafter is amended to authorize the further elimination or limitation of the liability of directors, then the liability of a director of the corporation, in addition to the limitation on personal liability provided herein, shall be further eliminated or limited to the fullest extent permitted by the Hawaii Nonprofit Corporation Act. Any repeal or modification of this Article SEVENTH (c) shall be prospective only and shall not adversely affect any right or protection of a director of the corporation existing at the time of such repeal or modification.

(d) Insurance. The corporation may purchase and maintain insurance on any person who is or was, a director, officer, employee or member of the corporation against any liability asserted against that person's activities done on behalf of the corporation as a director, officer, employee or member of the corporation, whether or not the corporation would have the power to indemnify such person under the provisions of the Hawaii Nonprofit Corporations Act.

(e) Initial Board. _____ directors shall constitute the initial Board of Directors. Their names and Addresses are as follows:

_____	_____
_____	_____

EIGHTH: Bylaws. The initial bylaws of the corporation shall be as adopted by the Board of the Directors. The Board of Directors shall have power to alter, amend, or repeal the bylaws from time to time in force and adopt new bylaws. The bylaws of the corporation may contain any provisions for the regulation or management of the affairs of the corporation that are not inconsistent with law or these articles of incorporation, as these articles may from time to time be amended. However, no bylaw at any time in effect, and no amendment to these articles, shall have the affect of giving any director or officer of the corporation any proprietary interest in the corporation's property or assets, whether during the term of the corporation's existent or as an incident to its dissolution.

NINTH: Incorporator. The name and address of the incorporator is:

Date: _____

STATE OF HAWAII

COUNTY OF _____

Sworn to before me this _____ day of _____, _____,
 by _____

WITNESS MY HAND AND OFFICIAL SEAL.

My Commission expires _____

(Seal)

 Notary Public

2002 UNIVERSITY SPACE SYSTEMS SYMPOSIUM

November 8-10, 2002

**University of Hawaii-Manoa
Honolulu, Hawaii**

Report authored by
Prof. Christopher Kitts, Santa Clara University &
Prof. Michael Swartwout, Washington University
December 9, 2002.

The JUSTSAP Small Satellite Working Group held its 5th yearly Space Systems Symposium on the campus of the University of Hawaii-Manoa from November 8-10, 2002 in Honolulu, Hawaii. Approximately 60 students/faculty/staff from a dozen U.S. and Japanese universities participated in this event, including first-time representatives from the University of North Dakota, the University of Arizona, and the Georgia Institute of Technology. This symposium also had the second consecutive year of strong participation from University of Hawaii schools.

As in previous years, the Symposium had two distinct sessions. In the first session, participating universities presented their own work and interests; their presentations highlighted previous USSS collaborative work and indicated their desire for future collaboration. This session lasted for about the first 2/3 of the Symposium's first day. In the second session, working groups dedicated to specific collaborations were formed. Each working group developed project plans and evolved designs relevant to their particular collaboration. These groups periodically reported their work to the full Symposium, thereby allowing cross-fertilization and questions/comments. By the end of the Symposium's second day, each working group had prepared a white paper summary and a presentation of their project and their plans for the upcoming year.

USSS Projects

This year's Symposium included 6 projects:

CanSat

This is an ongoing project that has been active since the Symposium's first year. Participants in this project develop soda can sized "spacecraft" to be launched off sounding rockets that are developed by amateur rocket enthusiasts in the U.S. This project has yearly launches (ranging up to approximately 15,000 feet or so) in the Black Rock Desert in Nevada. This year's project committed to the activity for another year with a new set of participants, with special discussion of the annual design competition.

CubeSat

This is an ongoing project that has been active since the Symposium's second year. Participants are developing a number of very simple 10-cm cube satellites for orbital launch. The first launch is

currently scheduled for Spring 2003. Previously active universities continued their work on this project; in addition, new universities joined the project.

Quest

This is an ongoing project that has been active since the Symposium's first year. This project involves the development of a small tethered satellite system to be launched from the Japanese HII-A launcher in 2-3 years. Kyushu University is the lead institution for this project, supported by other Japanese and U.S. schools. The teams set up their scheduled activity for the coming year with the intent to perform system-level functional demonstrations at next year's symposium.

Ground Station Network

This is an ongoing project that has been active since the Symposium's first year. Several Japanese and U.S. schools discussed their now operational stations including remote operation among Japanese schools. The schools then developed plans to extend remote operations during the next year. Work was also continued to improve interoperability through interface definitions.

Teleoperation of Mobile Robots

This is an ongoing project that has been active since the Symposium's third year. Several universities presented their functional systems for operating rovers (land, sea, and air mobile robots) via the internet. The group discussed plans to conduct joint operations during the next year including a spinoff symposium in June; they also brainstormed possible collaborative research areas.

Control of Flexible Space Robots

This is a new project sponsored by the Georgia Tech and Tohoku University schools, based on ongoing collaboration between the schools. The students described their present research in developing and experimentally testing algorithms to control the motion of large flexible space structures (such as robotic arms), and plans were developed to extend the collaboration to new schools.

USSS Issues for Further Discussion

The events of the Symposium raised a number of issues worthy of special comment:

- 1 - Like last year, a special emphasis was made to involve Hawaii participants. By holding the event on the UH Manoa campus, we were able to attract a large group of local students and faculty. Jeff Taylor from Hawaii Space Grant was kept informed of the event, and he sponsored the Manoa participants.
- 2 - It was generally concluded that more funding for U.S. participation would help considerably. Japan has approximately 2.5 to 3 times the amount of funding to support student/staff/faculty participation. Not coincidentally, Japanese attendance has historically been roughly 2.5 times that of U.S. participation. This year was the first time that U.S. participation matched the Japanese attendance; however, half of the U.S. attendees were students and faculty from the host school.

- 3 - At some point, it may be worth considering a name change for the Symposium. We have several groups building non-satellite systems. This is a minor point, but a more general name (e.g. the use of 'aerospace' vs. 'space systems') may be more indicative of the Symposium's activities - and it may serve to help expand participation.
- 4 - There is a good opportunity for cross-fertilization between USSS activities and the activities of other JUSTSAP working groups in Disaster Management, Satellite Communications, and Space Power. This is being discussed with members of those groups; one proposal is to expand USSS to include student activities associated with other JUSTSAP working groups.
- 5 - U.S. laws regarding technology transfer are having a significant impact on university collaborations, especially with projects involved in building and operations (Quest and ground station networks). We need help on this issue.

Overall, the Symposium was generally considered to be a great success by both participants and JUSTSAP observers. We plan to hold the event next year, and we certainly plan to continue working group activities throughout the year.

For questions or comments regarding the USSS event or this report, please contact Prof. Chris Kitts via e-mail at ckitts@me.scu.edu or by phone at (408) 554-4382.